May 2017

THE ROLE OF RESIDENTIAL COMMUNIIES FOR THE ACADEMIC AND SOCIAL SUCCESS OF UNDERGRADUATE WOMEN IN STEM MAJORS: THE CASE OF A PUBLIC UNIVERSITY IN ETHIOPIA

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Abstract

This study is an exploratory case study which explored the residential environment of an Ethiopian public university on its role for the social and academic integration of undergraduate women in Science, Technology, Engineering, and Mathematics (STEM) fields. It also explained how the social and academic integration of the women contributed for their overall college success.

There were three groups of participants; undergraduate women in STEM, female resident proctors, and relevant officials from the university and the Ministry of Education of the Ethiopian government. Each of the participants were interviewed on a one-on-one basis and the interviews were transcribed and coded for the analysis. Supportive quantitative data about the enrollment, performance and retention of students were also gathered from the university's registrar office and analyzed quantitatively to support the qualitative data obtained through interviews. The study was framed by Tinto's Integration Model and data were interpreted using Third World feminist theory.

The findings showed that due to the fact that all same-sex, same-major women living in the same rooms, and all who live in one dorm take similar courses throughout their program, and dormitories serving multiple roles, including being collaboration spaces, played a big role for better social and academic integration of the women. It is also found that their social and academic integration helped them to better perform in their majors by enhancing their sense of belonging in the male-dominated STEM majors, enhancing their commitment, and promoting peer encouragement. On the other hand, the findings also showed that there were some factors which have negative influence in the integration process such as negative stereotypes against the presence and good performance of women in STEM, lack of support system, and limited

interaction with faculty. So, the study recommends that working on improving the negatively influencing factors will enhance the positive impact the resident environment is bringing for the success of undergraduate women in STEM in the university studied.

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Dissertation

Submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy in Teaching and Curriculum.

Syracuse University

May 2017

Acknowledgements

Several times in my life I looked up, got amazed, and said "I know that was you, God. Thank You". The completion of this dissertation is one of those moments; Thank you, God.

In a tough road with so many ups and downs, no one deserves more thanks than a person who paves the way, keeps you move forward, and make you be tougher than the road. When I lost my esteem, you believed in me, and never let me give up on my work, you rather took me and my work go on, you unlocked the greatness buried within me, you enthused me to believe I had something important to say, and you normalized the craziness of being mother and scholar. Dr. Sharon Dotger, I am so grateful to have you as my adviser, for your dedication, and sustained guidance through writing this dissertation; I cannot thank you enough.

I am also so indebted to the person who believed in me even before knowing me, the one who is the reason for me to pursue my graduate study at Syracuse University, Dr. Gerald Mager. You made my early experience in Syracuse inspiring, you hold my hands, made me stand on my two feet, and made me walk through all the steps, thank you!

Dr. Gerald Mager, again, and Dr. Dawn Johnson, I thank you so much for serving in my dissertation committee and helping me turn sketchy ideas into a piece of scholarship. Your high expectation and continuous feedback gave this dissertation the look it now has. I also would like to recognize the input from my dissertation readers, Dr. Kelly Chandler-Olcott and Dr. Kal Alston. Your comments helped improve my work and I am so grateful.

I am also thankful for the staff and administration of the Ministry of Education of the Federal Democratic Republic of Ethiopia for allowing me to conduct the study in an Ethiopian public university. I also appreciate the hospitality and support of the staff and administration of

the University studied, with special thanks to Ato Antigen Birhanu and W/ro Tsige. I am indebted to the women in this study and their willingness to share their experiences and for their amazing insights; without them this study would not have been possible. Thank you!

My friends, the beloved Ethiopian community in Syracuse, and members of our mother church, St. Arsema and St. Kristos Semra, your love and prayers strengthened me when my legs were shaking and my hopes were under shadow. I thank you all with all my heart.

Anchiye (mom) and Aba (dad), I want to thank you for making me understand the importance of education at a young age, for setting high expectations on my achievement, and for always believing in me. I am so glad to show you that the seeds you planted in me has grown so big over the years; and am very grateful that your sacrifice of all your desires to make sure I had every opportunity to further myself academically, is not wasted. My sisters and brother, thank you for your encouraging words; I love you

My dearest husband and best friend forever, Tedishoye, words are not enough to thank you for your love and care, and for lending me your shoulder to cry on at times of difficulty. You believed on me more than I believed om myself; with all the same burden on yourself being a graduate student, you were willing to be Mr. Mom for our kids whenever I needed to be away. I truly know that without you, this work could not have happened. I love you.

My kids Babye (Zemariam) and Ematy (Arsema), you were my inspirations and the driving forces to complete this work. Thank you for your patience and for the missed special times during my study. As Babye always says, I love you both to Pluto and back to the Sun.

Thank God! To Him be all the glory forever!

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Acronyms

AIDS	Acquired Immune Deficiency Syndrome
EFMoE	Ethiopian Federal Ministry of education
GPA	Grade Point Average
HIV	Human Immunodeficiency Virus
I-E-O	Input-Environment-Output
K-12	Kindergarten through 12th grade
LLC	Living Learning Community
LLP	Living Learning Program
MoCiS	Ministry of Civil Service
MoE	Ministry of Education
MoLSA	Ministry of Labor and Social Affairs
MR	Ministry of Education Representative
NSB	National Science Board
NSF	National Science Foundation
NSLLP	National Study of Living Learning Programs
RP	Resident Proctors
SP	Student Participant
STEM	Science Technology Engineering and Mathematics
TVET	Technical and Vocational Education and Training
UNDP	United Nations Development Program
UNESCO	United Nations Educational Scientific and Cultural Organization
UR	University representative

US	United States
USAID	United States Agency for International Development

Chapter One: Introduction

Background of the Study

In recent years, promoting women's participation in science, technology, engineering, and mathematics (STEM) has gained the attention of many countries, especially the most industrialized ones. One reason is STEM jobs are expected to drive global economy for the decades to come (Sonnert, Fox, & Adkins, 2007). In relation to this, researchers believe that in an increasingly globalized world, scientific advancement and innovation are vitally important for maintaining national security, economic competitiveness, and quality of life for citizens (Ong, Wright, Espinosa, & Orfield, 2011). To insure this, countries need to produce adequate STEM experts, STEM educators, or STEM-literate citizens who can drive innovation, and spur economic growth (Business-Higher Education Forum, 2011). Despite this need for more STEM professionals, most nations are facing a big challenge to improve recruitment and retention in STEM fields (Ong et al., 2011). They are facing an even greater challenge in the recruitment and retention of women in these fields.

The problem of the underrepresentation of women, however, is not a big concern in all STEM fields. In many nations, while women outnumber men in some science fields such as the life sciences, they are severely underrepresented in some other STEM fields, such as engineering and the physical sciences. For example, in the United States, women received only 19% of bachelor's degrees in engineering, 19% in computer science, and 21% in physics in 2007 (NSB, 2010). Women earned only about 12% of the math and engineering bachelor's degrees awarded in the United States in 2009 (Tsui, 2010). Ethiopia is not any different; women accounted for only 19% of students enrolled in science and technology studies in 2013 (Ethiopian Ministry of Education (MoE), 2013). Although little is known about the share of women scientists and

engineers in Ethiopia, there are only a few women scientists and engineers known to the public. The same is true for women faculty in science and engineering fields in the public universities of the country; in 2013, men accounted for 80% of the staff in science and engineering departments at 13 public universities (Beyene, 2015).

Researchers continue to investigate women's participation in STEM due to the persistent underrepresentation of women in these fields for several decades and the need to strategize to improve their participation. Most research, however, focuses on Western contexts. Still, more studies investigating women's underrepresentation are needed because the existing research lacks consistency in their findings. Additionally, women's underrepresentation in STEM fields is a deeply rooted and multifaceted problem, which calls for research from different points of view. Some researchers described women's underrepresentation in STEM fields (e.g. NSF, 1988; NSF, 1994), others studied the challenges women face in these fields (e.g. Espinosa, 2011; Laefer, 2009; Sonnert et al., 2007), and others studied strategies that could enhance women's participation in STEM fields (e.g. Fox, Sonnert, & Nikiforova, 2009). There is also some collection of research on the factors that affect the persistence and success of STEM women during their undergraduate studies, among which are studies on the role of residence halls for the persistence of women in STEM majors (e.g. Belichesky, 2013; Inkelas, 2011).

Studies on students' college persistence in the US contexts showed that the college residential environment has a great role in integrating students to the overall college environment and students who are integrated to their college environment are more likely to persist and complete their degrees. Researchers found that there are theoretical and empirical linkages between college degree attainment and students' abilities to connect with a peer group, through which they develop positive relationships with faculty (Astin, 1993; Pascarella & Terenzini,

2005). Hill (2004) placed much more emphasis on the importance of housing, claiming that "residential halls often condense much larger issues than simply being a place to live in" (p. 25). She said the halls, in one way or another, express a school's academic mission, its unique culture, and its social philosophy. Residence halls facilitate the sharing of ideas among students, contribute to emotional growth, promote the development of peer relationships, help schools to revive a sense of community, and foster a sense of place (Hill, 2004).

In relation to this, a strategy to promote women's participation and success in STEM fields that has gained the attention of researchers is women's participation in STEM Living-Learning Programs (LLPs) on university campuses. LLPs are communities that involve undergraduate students who live together in a discrete portion of a residence hall (or the entire hall) and participate in academic and/or extra-curricular programming designed especially for them (Inkelas & Associates, 2004). LLPs are mostly studied in the context of the higher education system in the US, which prompts a question whether such programs or programs similar to LLPs have the same effect on other cultural contexts outside of the US.

While there are no intentionally designed LLPs in Ethiopia, the structure of residence life there is similar to that of LLPs in the US in some ways. For example, students of the same academic major live in the same residence halls. Majors with large enrollments may require an entire residence hall to accommodate students. Therefore, more studies are needed to investigate if the findings on the effects of LLPs on student success in the US apply in a different cultural context like Ethiopia. Accordingly, this present research will focus on the residential environment of undergraduate women in STEM in a public university in Ethiopia, and the roles it plays for their academic success in their major towards their degree completion.

An Overview of the Ethiopian Context

Ethiopia is located in the Horn of Africa and borders with the Sudan and South Sudan to the west; Eritrea to the north and north-east; Djibouti and Somaliland to the east; and Somalia and Kenya to the south. It is the second most populous nation in Africa, next to Nigeria, with a population of 94 million in 2013 and an annual growth rate of 2.9%. The country's population is highly diverse, containing over 80 different ethnic groups. The majority of the Ethiopian population is religious with 43.5% Ethiopian Orthodox Christians, 33.9% Muslims, 18.5% Protestant Christians, 2.7% traditional believers, 0.7% Catholics, and 0.6% other (Central Statistics Agency, 2014).

The history of education and politics in Ethiopia. Modern education has a very short history in Ethiopia; it began in the early 20th century. However, the history of traditional education, ቆሎ ትምህርት (*kolo timihirt)*, mainly led by the church scholars, goes back as far as the introduction of Christianity to Ethiopia - first century. And in the history of the country, education has been reformed several times, mainly driven by politics and the interests of donors.

Since the early 1900s, Ethiopia has experienced three systems of political governance, each distinguished by its education policy. The first system of governance was the Imperial system that started around 1916 and lasted until 1974; the second was the military/socialist system that lasted until 1991. The third and current federal system of governance began in 1991 and became fully operational in 1994 after running as a transition government for 3 years. Between the early 1940s and 1970s, during the imperial regime of Ethiopia, with the Emperor at the helm of power, the Ethiopian government believed strongly in the centrality of education as a vehicle of progress. The emperor believed that the purpose of modern education was to enrich Ethiopian civilization.

During this period, education was free and the returns on the investment in education were clear to understand. After just a few years of education, most children found themselves in high positions with an income that could have been more than ten times bigger than their parents (Negash, 1990). However, the narrative of the educational system did not resonate with the culture and Ethiopian ways of life (Girma, 2012). For example, the curriculum was developed and taught by western missionaries and did not have a coherent strategy. This occurred because the emperor believed it was an excellent strategy to educate and train citizens who respected their king, country, and religion (Negash, 2004).

The emperor strongly believed in the importance of education because the modernization process that he led needed many of young people to staff the growing sector of the state apparatus (Negash, 2006). However, in the late 1960s, public sectors began to require more than secondary education, and education came to be less of a profitable investment with so many high school graduates being unemployed. The reason is that the modern economic sector was too small to accommodate the growing pool of secondary school graduates. As a result, there was widespread dissatisfaction with the education sector from secondary school students who illustrated the future in miserable terms (Negash, 2006). One reason, among several others, for the downfall of the imperial regime was the pool of unemployed secondary school graduates.

The socialist/communist workers' party that followed the imperial regime was the complete opposite of its predecessor. While several stakeholders and donors like UNESCO, The World Bank, and USAID influenced the education sector in the imperial regime, the Soviet Union became a big supporter of the education sector in the communist party. Besides, educational experts from East Germany replaced experts from the United States of America, one of the main partners in the development of the Ethiopian education sector (Negash, 2006).

Strengthened by the ideological position of the Soviet Union and its Easter European allies, the socialist government also emphasized the role of education for development and promised that they would transform the economy and hence pull the country out of its poverty. Science and reason were considered as the tool to bring the country to development. However, the party forgot that science and reason require freedom to think, create, and express ideas (Girma, 2012). The government started to intrude in academic affairs, suppress oppositions, force Marxism as a mandatory course, and prohibit student organizations (Saint, 2004). This resulted in an isolated educational system and rising brain drain (Saint, 2004).

To develop knowledge in science and technology, the government produced new curriculum and introduced new subjects such as agriculture, production technology, political education, home economics, and introduction to business. However, due to the lack of prior planning and inadequate infrastructure, the pedagogical conditions were weakened. Still, enrollment rates in the 1980s continued to grow by 12% per year; although some argue that quantity was attained at the cost of quality (Poluha, 2004).

Although education was considered as one of the priorities in the socialist regime, hotter issues came that drew an ever increasing amount of the country's resources. Dealing with the civil war and the country's defense became major priority areas that took more than 50% of the recurrent budget throughout the 1980s. However, the party was not able to survive the wars in different directions of the country; the military president fled the country and the military collapsed.

Once the civil war was over and the socialist party was overthrown, the Ethiopian Peoples Revolutionary Democratic Front (EPRDF) came to rule the country in 1991. Since then, EPRDF is the governing party of Ethiopia, and it configured the country as a federal state.

Although there have been different ethnic and regional partitioning of the country in the past two decades, Ethiopia is currently made up of nine federal states and two chartered cities. In 1994, this government brought a new educational policy, which is the third in the history of the nation and the landscape of Ethiopian education has changed dramatically. By mobilizing external funds like foreign aids and loans for the expansion of the education sector, the gross enrollment ratio in primary and secondary schools increased from 35% in 1990 to 70% in 2004. More importantly, enrollment in higher education increased from 18,000 in 1991 to 147,000 in 2003. Moreover, between 1991 and 2003, there was a growth in the private sector in higher education. The enrollment of women in higher education also increased many fold. In 2004, more than 50% of the enrollment in private higher institutions were women. However, in the institutions run by the government, female enrollment was far below 20%. One reason for that is private institutions required lower entrance grades than government owned institutions. Furthermore, in most cases, fewer women scored the grade required to enroll in government owned institutions.

The rapid expansion of the education sector from primary to higher education took place due to the belief in the role of education to alleviate poverty (Education and Training Policy, 1994). This idea mainly came from donors (Negash, 2004); for example, the Ethiopian government was obliged to submit a Poverty Reduction Strategy Policy, which includes a policy of rapid expansion, for one of the major donors, The World Bank, as a partial condition for continued loans and aid. However, as always, the allocated budget from the government to manage the education sector is far too small (World Bank, 2004). The World Bank's report also noted that although primary school enrollment in urban areas became nearly universal, it was only 45% among rural children. Besides, 25% of newly enrolled rural children drop out before making to the next grade and nearly 50% of them hardly stay in school for five years (Word

Bank, 2004). According to the report, for the country as a whole, only 30% of the school age population completes the first four years of primary education and only 20% complete eight years of schooling.

The expansion of higher education institutions in Ethiopia. Although the rate of expansion of education at the primary and secondary levels since the 1960s was predictably uniform, there was a major change at the level of higher education in the EPRDF regime. Ethiopian higher education has a history of about half a century. The first higher education institution in the nation was Addis Ababa University, originally called the University College of Addis Ababa. It was established in 1950 and later renamed Haile Selassie I University in 1962, after the then Emperor. The university got its current name in 1975, and stayed one of the only two universities in the nation for some time. Until 2005, there were only eight public universities in the nation, along with several other private colleges. However, due to the commitment to higher education in the country, Ethiopia increased its universities to 22 by 2010 (Ashkroft, 2010), and another ten were opened between 2010 and 2012. In general, access to post-secondary education has grown four fold in the last two decades (Tessema, 2009). As a result, the number of students admitted to universities has also dramatically increased. However, some may argue that the quantity of university graduates is achieved over the quality of education. For example, the dramatic expansion of higher education institutions and their massive student admissions resulted in the decline of quality of education because of lack of necessary infrastructure and overloaded and underprepared university faculty (Dereje, 2007; Negash, 2004). There is a shortage of well-qualified educators and even those present have been chronically and persistently overworked (Tessema, 2009). Some of the problems created due to

the dramatic expansion in the sector include very high student-section and teacher-student ratios, and lowest real spending per student.

Currently, there are 32 public universities, with four more to be added soon (MoE, 2015), and several private higher education institutions. Although the government sets the minimum college entrance grades for both private and public higher education institutions, the way students are placed in either type of institution varies. In private colleges, since students cover all their expenses, they can join any higher education institution they like, as long as they fulfill the entrance requirement set by the government. However, in public higher education institutions, since part of the educational and living expenses are covered by the government, placement is done by Ministry of Education based on some variables such as Ethiopian Higher Education Entrance Examination scores of the students, the availability of fields of study, the number of students that each university can accommodate, the 70:30 intake policy favoring STEM degrees, proximity of the institution to student's home, and so on (Feleke, 2008).

As the number of universities increased, the number of students going to college increased. In the 2012/13 academic year, a total of 294,357 students were placed in public universities in a regular program,[1] of which 82,301 (27.9%) were females. This was a 0.2% increase for females from the previous academic year. In 2011/2012, there was a 1.2% increase in female enrollment from the previous year (Ethiopian Federal Ministry of Education (MoE), 2013; MoE, 2012). Although the similar census data for the year 2007/2008 does not show the number of students who were enrolled in public universities under the regular program, Feleke

[1] Higher education institutions in Ethiopia offer different types of programs such as a regular program, an extension program, in which students attend evening and weekend classes, a summer program, and a distance education program. Regular programs are the most privileged, and government sponsored students commit to share a small portion of the entire college completion expense after graduation. Regular program students are assigned by the government and are commonly eligible for in-campus residence halls and dining services.

(2008) indicated that about 56,000 students were placed in public universities. This means that the university enrollment increased more than 300% in only five years.

The focus on STEM education. The expansion of universities also has another aspect relevant to this study: placing the highest priority on science and technology fields. The focus on science and innovation is considered a tool to contribute to the growth of the nation and to transform the country's economy from an agricultural to an industrial one (The Ethiopian Herald, Nov. 2015). For this assertion, the EPRDF government benchmarked some South East Asian countries who achieved successful economic and social development in the last few decades mainly due to having both an export-based market economy and accumulation of technological capabilities.

Eventually, Ethiopia has scored a double-digit growth in GDP for eight consecutive years between 2003 and 2011 (Science, Technology, and Innovation policy, 2012). Nevertheless, there is evidence to show that the economic growth that the country accounted in these years will not be sustainable unless a strong national technological capability is established in the country. Therefore, the government has enacted policies and regulations that focus on incorporating science, technology and innovation to further ascertain Ethiopia's growth trajectory (Minister of MoE, Demeke Mekonen, quoted on the Ethiopian Herald, 2015). One of the policies developed is the country's Science, Technology, and Innovation (STI) document that takes the national vision of alleviating poverty and joining mid-level income earning countries by the year 2025 (STI policy, 2012). One of the critical issues identified in the STI is the need for technology transfer. However, the policy admits that the national capability to learn, adapt, and utilize foreign technology is still at a very low stage. This is because the level of qualified work force capable of transferring foreign technology is low, certainly inadequate to facilitate the effective

transfer of technology (STI policy, 2012). This, in turn, calls for other policy issues, the need for human resource development. The country needs competent local technicians, engineers, and scientists, who can search for, select, diffuse, adapt, and use technologies from other countries. Hence, the need for the national education and training system to place emphasis on producing engineers and natural scientists in manufacturing and service-providing enterprises was emphasized.

The following are three of the strategies named to address these critical policy issues stated in the policy document.

- Develop science and technology institutions that focus on producing highly-qualified technicians, engineers and scientists in line with the demand of the national economy;
- Focus on modifying the balance of the enrollment numbers of higher education students in favor of the science and technology human resource development need of the country and conduct practical training in cooperation with industry;
- Increase the number of females enrolling in engineering, in science, and in Technical and Vocational Education and Training (TVET) institutions (STI policy, 2012, p.7)

Hence, the government reframed, the higher education system. The major efforts included the establishment of institutes of technology in 10 universities, the setup of two science and technology universities — one of which is investigated in this study — and the 70:30 university intake ratio in favor of STEM fields. This was a direction set by the MoE with a goal to enroll 70% of incoming students in science and technology and 30% in social sciences and humanities in almost all public universities. The ratio was even larger for 2012/2013 academic year, where the government's regular program undergraduate intake ratio of science and technology to social sciences and humanities was 74:26 (MoE, 2013). Despite this increase in

science and engineering enrollment, women still constituted only 19% of the total science and technology enrollment in 2013 and only 20% of faculty in science and engineering fields in the public universities of the country in 2013 were women. One big problem facing this fast growth of STEM man power is higher unemployment rate because there are more students graduating with STEM degrees than the job market demands. The expansion of universities and the focus on STEM degrees were not coupled with expanding the number of STEM jobs. As a result, students with college degrees are doing work that a 10th or 12th grade completer can do.

Although there is some literature on the efforts of the Ethiopian government to promote STEM education at post-secondary level, and increase the participation of women in those fields, no reports have addressed efforts at the elementary and secondary education level to make the students better prepared for the STEM-focused higher education programs. In the years that I was a high school teacher in Ethiopia, there were annual science fairs and competitions between schools in scientific application and innovation. The rationale behind this was to encourage students to become attracted to the science field and to develop their critical thinking skill as a means to apply the science they know and come up with new scientific innovations. However, there was no special support, to my knowledge, offered for women in this regard. Women's overall status in Ethiopia is discussed in greater detail in a separate section following this.

Assignment to colleges and residences. The Ministry of Education assigns students to public universities and then to specific disciplines in the universities. Although students choose their intended public universities and specific majors in descending priorities, they are not guaranteed assignment to a university and/or a major of their choice. However, the higher their college entrance examination scores the more likely they will be assigned to a major of their choice. Although there are still very few women in STEM majors, due to the new policy favoring

science and engineering university placement, more women are likely to be assigned to these fields with or without their preference, but still in fewer proportion than men.

After students are assigned to a public university and major, they are notified through a website specially designed for this purpose by the MoE. Then, each university assigns dormitories for every student. Men and women do not live in the same buildings in any of the universities, and in most of the universities, all students in the same majors will be assigned to the same residential buildings and will be placed in dormitories by alphabetical order of their first name. They will live all together until they graduate, if they do not quit or face academic dismissal. The number of students in one dorm varies in each university depending on how the buildings are designed and the size of the rooms. Although one of the variables considered when assigning students to each university is the availability of rooms to accommodate to students, universities sometimes will have plenty of open spaces after a semester. In some cases, dormitories hosting a large number of students will have more space after the dismissal and withdrawal of several students at the end of a semester.

Once students in a public university are assigned to a specific major, there is no way to switch to a different one; the only options are either staying in the assigned major or leaving the university once and for all. This situation makes the students live under lots of pressure. They do not get any support from the university; there is no tutoring center, no teaching assistants, or any other system to help them. The only support system they have is the support they give each other, each sharing the same problems and finding strength from one another, and learning from the success and failure of one another. This is because the curriculum focuses exclusively on to academics while neglecting the interdependence of the emotional, social, and academic selves of students (Belichesky, 2013). The social, emotional, and academic dynamics, according to

Belichesky (2013), are intertwined and cannot be separated; the students' emotional value on being a member of a group (say, their residence) has the potential to influence their self-concept. Because this value is determined by creating an in-group and out-of-group social dynamic that positively characterizes the in-group and negatively stereotypes the out-of-group in such a way that by belonging to the perceived in-group, an individual's fear of uncertainty about his or her social identity can diminish and his or her self-esteem can increase (Tajfel, 1982). This is even more applicable to the Ethiopian context because of the stronger dependence and the social value system of the Ethiopian culture. Belichesky (2013) showed in her study that the emotional support the female students got through close friendships made them able to turn to other women in times of need, either academic or social. Therefore, emphasizing the academic social and emotional selves of the students has great advantage for the success of women in STEM majors. With a very strong interdependence in the Ethiopian culture, the value of community is even more important for the women in Ethiopian universities.

Although the problem with women's participation and performance in STEM fields is intertwined and complex, this present research focused only on identifying the experience of women in science and engineering in their residential community and the role of this community in their academic and social integration and overall college success. This residential community is not intentionally designed to support a certain group of students. Rather, it is a community that the education systems created where all same sex students in a same college major live together and deal with their academic and social problems together. The students are assigned to dormitories with same major partners in alphabetical order just for the sake of convenience in the assignment process. This residential community does not include all the features of a well-designed LLP where there is mentorship, specific course requirements, student-faculty

interaction, research opportunities for the students, and/or registration for membership (Inkelas, 2011). Nonetheless, students living in the same residence halls where they can work and study together are a big component of LLPs, which this study will take into consideration.

Personal Experience

I obtained my undergraduate degree in one of the oldest public universities in Ethiopia in the mid-2000s. I was assigned to this university by MOE; I was not able to choose which college to attend. After finishing freshman year, the university assigns every student to only three major disciplines that the university offers degrees in: Medical Science, Engineering, and Education. I chose Medical Science, but despite my outstanding background, I was assigned to major in Education, the least preferred of all. That was a major obstacle in my life that negatively influenced my life then and even up to now. I majored in Chemistry Education with very few other girls in my class. There were challenges to success in every direction for the females not to be successful in a science field: the dominant male classmates, the only-male faculty, and stereotypes in the university community. Male students ridiculed me for my hard work like "No female ever earned distinction in this campus, why do you drain yourself?" I also remember a faculty member humiliating the girls in my classroom by saying, "Am I in a [language] class?[2] What are all these females doing here?" This and other hardships hindered my motivation to further my education in the sciences; I rather chose to master in education. But my experience as a female in a science major keeps me connected to women in STEM in different ways. When I started my PhD study, I wanted to write my dissertation on the experiences of women in STEM in some way.

[2] There were more females in Language majors than in any other majors.

Writing my qualifying exam questions as a requirement for my PhD study, I read about LLPs in the American contexts, which are shown to have positive impacts on the performance and persistence of women in STEM. This made me think such living arrangements have so much in common with how students live in Ethiopian public universities; all women in the same major live in the same residence buildings, and dormitories. It has been the case since my sophomore year in college, more than a decade ago, and has not changed. This is how I became interested in studying the impact of such residential arrangements for the success of women in college STEM majors.

Purpose of the Research and the Research Question

Though few in number, there are some studies that investigated the impact of living learning communities on student success in American higher education institutions. These studies showed that residential communities, such as living learning communities, have different benefits for students. These include improved academic performance and social transition (e.g. Helman 2000; Inkelas 2011), persistence in major (eg. Gandhi, 1999; Belichesky, 2013), intellectual ability (eg. Inkelas & Wiesman, 2003), and post-college STEM pursuits (e.g. Hathaway, Sharp, & Davis, 2001). Studies also show that the campus residential environment positively contributes to students' college transition and their perceptions and sense of belonging, which in turn increases their college persistence (Hurtado & Carter, 1997; Johnson, Soldner, Leonard, Alvarez, Inkelas, Rowan-Kenyon, & Longerbeam, 2007). However, there are no available studies on the residential communities of Ethiopian higher education institutions.

This study investigated how residential communities affect students' social and academic integration and overall college success. To do so, the study investigated a specific residential community and how it does or does not affect the integration process. This makes the study

different from what others have done by emphasizing the importance the interaction between campus communities and the individual student (eg. Tinto, 1975; 1993). Furthermore, this study adds to the empirical evidence to support claims of the importance of community and positive sense of community on university campuses for its influences on degree completion (Astin, 1991, Kuh, 2001).

Research question. Although much has been written about the positive effect of on-campus living on different college student outcomes in Western countries, including degree completion (Astin, 1993, Tinto, 1975; 1993), it has yet to be applied to the unique residential experience in Ethiopian public universities. This study, therefore, investigated the experiences of women in science and engineering in their residential community and the role of this community for their academic and social integration leading to successful college completion. In general, the study was guided by the following research question: What role, if any, does the residential community of undergraduate women in science and engineering majors play for their academic and social integration and overall college success?

Significance of the Study

The study is one of the very few scholarly works in the context of the Ethiopian higher education system contributing to promote participation and success of women in STEM fields. The underlying issue of the study is nationally important either in theoretical terms or in policy or practical terms. Theoretically, it adds to the literature on residence and women in STEM as well as it paves the road for future researchers to consider studying women in STEM majors in Ethiopia and their college experiences. At the same time, it identifies how the residential communities of undergraduate women in STEM majors affect their college experience and proposes solutions that can be potential inputs for future policy reform efforts. In other words, it

allows the Ethiopian Ministry of Education, particularly public higher education institution governing bodies, to reconsider their student assignment practices and their residential apportion practices. Moreover, as the government of Ethiopia is striving to ensure equal opportunity for women in all spheres, this study contributes in solving one facet of the gender disparity in the nation's higher education system. As it is promised by the researcher at the time of data collection, copies of the present study will be accessible both for the university and for Ministry of Education.

Outline of the Dissertation

This dissertation is presented in five chapters. The first chapter identified the problem to be studied and the significance of this study to the research on women in STEM. Chapter Two provides a review of relevant literature regarding women in STEM, barriers to their persistence in STEM, intervention mechanisms, college residence halls, and LLCs and their roles for the success of women in STEM. Chapter Three provides a detailed overview of the theoretical framework of the study and the research methodology and design. Chapter Four presents the research findings and the analysis of the findings. And finally, Chapter Five includes a restatement of the purpose of the study, the implications of the findings to practice, and recommendations for future research.

Chapter Two: Review of the Literature

Introduction

The underrepresentation of women in Science, Technology, Engineering, and Mathematics (STEM) disciplines has been a matter of record for some time in the United States and several other countries (Seymour & Hewitt, 1997). Ethiopia is similar; despite increased enrollment in the past few years, women still constituent only 19% of all STEM majors in public universities (MoE, 2013). Studies in the US also showed the same trend; despite the gradual increase in women's enrollment and success at all levels of STEM education in the last few decades, women are severely underrepresented in the majority of science and engineering occupations (NSF, 2011). Similarly, Szelenyi, Denson, and Inkelas (2013) found that although women fill close to half of all jobs in the US economy, they hold less than 25% of STEM jobs.

A report on the 2014 International Women's Day, entitled "*Women in Science – Explore the Data for Countries Worldwide*" presented data produced by UNESCO Institute for Statistics (UIS). The data shows the percentage of women by regions and certain specific countries for the pipeline of enrollment in higher education institutes (e.g. bachelors, doctoral, research), employment in various sectors (e.g. public, private, academic), and employment in different fields (e.g. natural sciences, engineering and technology, agricultural sciences, humanities). The data from Ethiopia shows that women constituent only 7% of research jobs and they hold only 12% of those in natural sciences (UIS, 2014). Ethiopia's case is one of the worst in the comparison of women's participation in STEM education and STEM careers. Although Ethiopian women share many of the problems with women in other nations, they still have their unique challenges when it comes to education, and enrollment and success in STEM fields.

In this section, I review three main bodies of literature to contextualize the need for a study about women's experiences as STEM majors in an Ethiopian public university. The first body of literature focuses on the status of women in Ethiopia. Although there are many problems that Ethiopian women share with women in the rest of the world, there are a lot of unique experiences that they face. So, this section describes specifics about the gender role, economic status, education participation, access to education and other resources, and rights and responsibilities of Ethiopian women. The second body of literature discusses about the barriers for the participation and success of women in STEM. Because of the dearth of literature specific to the experiences of Ethiopian women in STEM, most of the literature reviewed in this section investigated problems in American context. However, several of the problems discussed in those studies are common for women in Ethiopia in one way or another. The third body of literature focuses on college residence with special emphasis on living-learning communities. In the US, living-learning communities have shown promise for plugging he leaky pipeline of women in STEM. It is important to discuss this topic because part of the goal of this study is to determine the degree to which this US literature base applies to an Ethiopian context.

Women in Ethiopia

Women comprise 50% of the Ethiopian population and they are actively involved in all aspects of their society's life. Although, women's share of the division of labor differs from place to place and from culture to culture, their average working day is believed to vary between 13 and 17 hours per day (Ministry of Labor and Social Affairs (MoLSA), 2012). Their status is low where they: (a) are generally poorer than men because they earn less; (b) are less educated; (c) are increasingly becoming heads of households, with no resources to support their dependents; (d) do not enjoy due acknowledgment for their labor contribution, particularly in

agriculture, and (e) do not have decision making power. Ethiopia is a patriarchal society that keeps women at a subordinate position, using religion and culture as an excuse. These excuses, for many years, have been supported by laws and legislation that uphold patriarchy and women's subordination. This has brought about and maintained disparities between men and women, in division of labor, share of benefits, in law and state, in how households are organized, and how these are interrelated (Kassa, 2015). They also suffer from work stereotype and gender distribution of labor; more are occupied in economically invisible work. Women experience lower socioeconomic status in general and hence are marginalized from making decisions at all levels. Moreover, Ethiopian women are poor in terms of access to resources, services and employment (Japan International Cooperation Agency (JICA), 2006).

The causes for this multi-dimensional gender disparity are multi-faceted and intertwined. Some of these causes include: a long-rooted culture of patriarchy, harmful traditional practices (HTPs) including early marriage, and wrong interpretation of religious teaching. Advocates for gender equality and the abandonment of HTPs argue that early marriage is one of the most harmful practices as it usually denies girls educational opportunities, leads to poverty and economic insecurity, and has a serious negative impact on their health and decision-making capacities. It also reinforces other forms of gender-based violence and problems (Alemu, 2008). Though less common, abduction is also a big problem for Ethiopian women, mainly in rural regions. In most of these cases, the abductor, with the support of friends and family members, kidnaps a young woman in the course of her normal activities, such as fetching water or collecting firewood. The young woman is then raped by her abductor, after which she and her family feel they have no choice but to agree to a marriage because the victim's perceived marriageability is severely compromised (Erulkar, 2013). As in the case of abduction, most of

the problems that women face are worse in rural areas than in urban cities. For example, a 2013 study of more than 1600 women constituting 40% from urban and 60% rural areas showed that among women married before age 15, 82% resided in rural areas and 79% had never been to school. Only 3% had attained any secondary schooling (Erulkar, 2013).

Although education has become more accessible for rural children in recent years than in the past, they still need to travel a long distance to attend school because there are only a few schools, in some cases a single school, serving kids from a very large geographic area. Most rural neighborhoods do not have secondary schools at all. Therefore, families need to send kids as young as 14 years old to nearby towns where there are schools to live in groups in rental rooms. The children need to travel back and forth to their home over the weekend to bring their food for the week, which in most cases runs out or gets spoiled before the end of the week. Still, only a few families could afford to do that; not only for the lack of money to pay for the rented house, but if the kids are gone for school, they will not be supporting the family in farm work or any sort of support the family demands. As a result, it becomes a dream for many kids to be able to attend secondary schools. Although this is a problem for both rural boys and girls, it is even worse for the girls. For example, if a family has a boy and a girl and if they can afford sending only one child, most families send the boy to school and make the girl stay at home. One of the reasons for that is the belief that the girl will, anyway, end up marrying someone and raising a family soon. And another reason is that, the girl is believed to have more challenges leaving her family to live in bigger towns, in rented houses, and the long walk back and forth from her home town to her school town is more dangerous for the girl than the boy, as she might be raped, or abducted, and forcedly terminate her schooling.

In the last two decades, however, efforts have been made to address the problem of gender inequality and gender based discrimination in the country. Several schools are being built in rural areas, the community is being taught about gender roles and women's rights, and new laws and policies came in effect that assure gender equality. To mention some, the Constitution of Ethiopia, adopted in 1995, assures women of equal rights with men in every sphere and emphasizes affirmative action to remedy the past inequalities suffered by women. It also reiterates the rights of women to own and administer property, as well as access to reproductive health services (Article 35). Furthermore, based on the constitutional rights of women, the pension benefits of female civil servants are given to their survivors, maternity leave has been extended from 45 days to 3 months, and the family law has been revised. Furthermore, Ethiopia has ratified the UN charter on Human Rights and more importantly the Convention on the Elimination of All forms of Discrimination Against Women (CEDAW), which outlines a variety of political, social, economic, and legislative issues that countries have to work on to eliminate discrimination against women and create equality between men and women. It also reiterates that state parties will adopt the necessary measures to achieve human rights of women identified in the Convention. As a result, the government has also been promoting the mainstreaming of gender in all of its development policies and strategies to address gender inequality.

Equal educational opportunities for women is also one important thing that the Ethiopian government has emphasized in an effort to improving the livelihood of Ethiopian girls and women. There is also a big push and high expectations from major donors for the education sector, including United Nations Educational, Scientific, and Cultural Organization (UNESCO) and the World Bank to close the gender gap in school enrollment and higher education

admission. With all this effort, even though the gender gap in school enrollment still exists in rural regions, girls are equally represented in most schools in major cities.

As Ethiopia is one of the nations that ratified international conventions like the CEDAW, which assures that women have equal rights with men in education, the country also made the rights of women part of the constitution. The constitution of Ethiopia even goes a step further to promote the participation of women in all sectors, including education, by making some affirmative measures to compensate what women lost in the past years. For example, article 35(3) of the Ethiopian constitution states that "Considering that traditionally women have been viewed with inferiority and are discriminated against, they have the right to the benefit of affirmative actions undertaken for introducing corrective changes to such heritages. The aim of such a measure is to ensure that special attention is attached to enabling women to participate and compete equally with men in the political, economic and social fields both within public and private organizations." One platform where affirmative action comes in effect is women's higher education enrollment where the minimum college admission score is lower than that of men. As a result, higher education enrollment of women increased significantly in the past few years in Ethiopia. However, there is still a big gender gap in the participation of women in college STEM fields which in most STEM majors, women constitute less than 30% of the total enrollment. As the underrepresentation of women in STEM fields is a global problem, the United Nations (UN) also believes on the need for greater investments in teaching science, technology, engineering and math to all women and girls as well as equal access to these opportunities. It also gave tremendous funds for the Ethiopian government's effort to promote women's enrollment in STEM fields. Part of the support includes the launching of the manifesto for

women in science in 2016 to engage governments and stakeholders in promoting the full participation of girls and women in science.

Considering the global nature of the problem of women's underrepresentation in STEM, the UN has been working on bringing women to a better position in science and technology especially in developing countries, including Ethiopia. In 2011, there was a lot of work done internationally to create awareness about this fact and the UN announced the theme for international women's day of 2011 to be "Equal access to education, training and science and technology: Pathway to decent work for women". Moreover, in 2015, it designates February 11 to be the International Day of Women and Girls in Science. Just recently, in the second year the day is celebrated with a theme "The World Needs Science and Science needs Women". The secretary general of UN noted in the day that for too long, discriminatory wrong stereotypes have prevented women and girls from having equal access to education in STEM. He mentioned that these stereotypes deny women and girls the chance to realize their potential – and deprive the world of the ingenuity and innovation of half the population. The Ethiopian government also echoes this same idea in designing and implementing development policies, including the ones in the education sector.

Barriers for the Participation and Success of Women in STEM

Identifying the reasons for women's underrepresentation in STEM in the United States has attracted significant research attention in the last few decades. Though some researchers share similar reasons for the underrepresentation of women in STEM, many factors have been identified as contributing to their persistent underrepresentation. Many believe that a greater number of female students would be attracted to complete STEM majors if those fields could more effectively tackle obstacles that hinder the progress of women (Tsui, 2010).

Questions have been raised about the underrepresentation of women in science related fields from different perspectives. Feminists have been particularly concerned with questions of authority in teaching, that is, how to deal with authority in teaching subject matter authored mostly by men (Brickhouse, 2001). Thus, feminists have sought to develop pedagogies that change conventional hierarchies between teachers, students, and subject matter in such a way that teachers are facilitators of learning. Therefore, the mostly male science teachers will not control the teaching learning process in their own masculine approach. There is also considerable literature on science assessment and gender. Feminist researchers have studied how boys and girls respond to different forms of assessment and have described ways of making assessment fairer. In Ethiopia, all students at all levels are assessed in a same way. When it comes to science, almost all teachers and instructors of science and technology are males; and the same is true for book writers and curriculum designers. This prompts a question of gender insensitivity in the ways those subjects are taught. However, there is a quota system for admission in public higher education institutions that allows women to be admitted to public universities with a relatively lower grade. Nonetheless, there will not be any special support provided to them after they get enrolled to the universities. Though there may be so many goods in the quota system, it has one big problem of worsening stereotypes against the capability of women especially in STEM fields. I had a conversation with an Ethiopian friend of mine who is a civil engineering major and did his undergraduate studies in Ethiopia. He told me that men in his department were not so worried of failing in a course or getting dismissed from college because they think "the storm will first hit the females because most of them are not even qualified to be in the university so, they will get back to where they belong to" (Zebene, March 19, 2017, personal communication). However, the fact is that there are quite a few women who were assigned by the quota, the

majority of the women competed with the men equally. This type of thinking has a double disadvantage for the women; it reduces their self-esteem and makes the already male-dominated system more unsuitable for women by empowering the men to discriminate the women. To better understand the barriers for women's participation in STEM fields, I will categorize the challenges into two broader ways based on Xu's classification as gender-based versus structural categories (Xu, 2008).

Gender-based Barriers

A persistent stereotype fueling the underrepresentation of women in STEM is the notion that women possess inferior math and science abilities, despite empirical evidence emerging in recent decades, which showed that men and women generally possess similar math and science abilities (Tsui, 2010). In addition, the historical male exclusivity in science and math related fields created outsider status for women, even if they became insiders in those institutions (Cantor, 2010). The other related problem is that being a numerical minority in work settings can activate gender stereotypes, which in turn pose a particular threat to the identity of women in STEM. When they try to grapple with the negative stereotype about their social identity, women experience a situational burden that interferes with their performance (Richman, vanDellen, & Wood, 2011). In relation to this, Tsui (2010) has identified, among other barriers, that individual acts of biased behavior, often committed unintentionally, may appear on their own as seemingly small and trivial, but collectively and over time exert an effect of undermining females' self-confidence in their academic abilities, hindering learning, dampening academic and career aspirations and lowering general self-esteem. On the other hand, a study by Cereijo, Tyler-Wood, and Young (2002) showed that such gender-based discriminant factors for women have positive implications for men. As a result, boys display more positive attitudes towards science

and math, which is highly correlated to their science achievement. This in turn leads them to better participate in STEM fields contributing to the widening of the STEM gender achievement gap.

These gender-based barriers are long rooted. There is also a big connection between students' gender biased precollege experiences and their future STEM degree attainment. Ma (2011) has shown that three precollege conditions — achievement, course taking, and attitudes/aspirations in high school — can potentially influence women's intent to persist in college STEM majors and pursue STEM careers. Tyler-Wood, Ellison, Lim, and Periathiruvadi (2012) said that though it is commonly believed that boys have higher academic achievement in STEM than girls, some literature suggests that the gender gap is less of an ability gap than a gap in perceptions of science careers. This, in case of women, is negatively impacted by different stereotypical discriminations. The same is true in Ethiopian schools; girls are not expected to be smart in science and mathematics and will be considered extraordinary if they are. It is usually reasoned that there are only a few women in STEM disciplines because they are less smart in science and math. Besides, STEM careers are figured as masculine and that Ethiopian society is protecting women by not allowing them to pursue the STEM path (Semela, 2010).

Structural Barriers

In her discussion about the attrition and turnover of women faculty in STEM, Xu (2008) said that a deficient work climate and negative individual experiences directly hinder the success of women faculty in STEM, and lead to their low job satisfaction and high attrition and/or turnover rate. She said that barriers such as discrimination at hire, ‘‘glass ceiling’’ in promotion, and inequity in salary and support can potentially affect women's participation in STEM fields, especially in academia (p. 608). Supporting this idea, while discussing the underrepresentation of

women in tenure track faculty positions, Cantor (2010) said that some of the reasons for the problem include lack of hospitable climate, lack of collaboration and social support, and presence of rigidity in such institutions. Tsui (2010) described such factors as "chilly climate" (p. 142), in which women are treated differently by male and female faculty, as well as by fellow students.

The other structural barriers contributing to women's underrepresentation in STEM, according to Seymour (1995), include such factors as competitiveness of classroom culture, gender role expectations, different learning styles, and K-12 experiences rejecting women's interest in STEM fields. This rejection of women in K-12 STEM subjects in turn increases the gender achievement gaps in secondary education in favor of the men and this in turn impacts women's later participation in STEM (Van Langen et al., 2006). Supporting this, even though there are considerable differences among countries, the result of a study indicated that the smaller the gender achievement gap for mathematics and science literacy between males and females in secondary education, the greater the STEM participation of females in higher education (Cereijo et al., 2002)

The masculinity of the engineering culture, according to Seymour (1995), is another structural barrier, which seems to have a negative effect on women's choices and distances them from the fields of the sciences and the new technologies. Some argue that science is suffering from the predominance of certain styles of doing science. If every individual were equally represented, irrespective of gender and race/ethnicity, scientific communities would benefit from greater diversity in styles of doing science (Rolin, 2008).

There are additional aspects contributing to women's representation in STEM fields. Though research studies show that the number of women participating in STEM fields is

considerably increasing, women are still marginally represented in the academic careers and in the top industrial and managerial positions. Researchers have given two major reasons for this problem; one is there are fewer women entering STEM fields, and the other is that women are more likely to leave STEM somewhere in their career path (Ma, 2011). My discussion of these points will be based on Xu's (2008) framing of the case as a "deficit model" (p. 609) and a "pipeline model" (p. 608).

Deficit model. This model deals with the inadequacy of the supply of women in the STEM fields. Xu (2008) said that the ''limited opportunities faced by women scientists in a gender-biased academic environment is the focal point of this model" (p. 609). It is often so difficult for women to enter traditionally male-dominated and demanding areas of work, and even if few do manage to enter, they appear to experience unequal treatment, both directly and indirectly, when compared with their male colleagues (Assimaki, Koustourakis, & Papaspyropoulou, 2012; Cantor, 2010). In general, the structural barriers discussed above contribute most to women not to joining academia in the first place, because the institutional culture of academic institutions favors men (Cantor, 2010).

Xu's study has shown that women faculty's attrition from academic STEM disciplines may not be a credible explanation for their underrepresentation in the top positions. Subsequently, it suggests that the major leakage in the supply pipeline is more likely to be the disproportionately small number of women hired into faculty positions (Xu, 2008). In her study about the gender differences in the paths leading to STEM baccalaureate, Ma (2011) used data of postsecondary students at three locations, high school, early college study, and late college study. In her findings, almost 30 percent of male students intended to major in STEM fields during high school but only 10 percent of female students had similar plans. However, males experienced a

significant loss at the second location of the pipeline (early college studies) when they declared their initial college majors, and this loss continued toward degree attainment. Females, on the other hand, did not experience any loss from the first location to the second location (high school to early college); instead, a slightly higher proportion of females declared their initial majors in STEM than did so in high school. Though females experienced some loss from the second location to the third, their loss was much less salient than that of males. This shows that the problem of women's underrepresentation in STEM fields is due more to their recruitment in those fields than it is a pipeline problem.

Pipeline model. This model is about sustaining women's involvement in STEM fields once they choose to follow the STEM pathways. Xu (2008) explained the pipeline model as the volume of flow of women in STEM. The problem is, all who start in STEM do not flow all the way through the pipeline; some switch to a non-STEM discipline in graduate school, or some follow non-STEM career after having a degree in STEM. Laefer (2009) has studied the gender disparity in engineering as a function of physics enrollment and its implication for civil engineering. She focused on American students in engineering majors and found that the higher the degree level, the greater the disparity grows, especially for American citizens and permanent residents, with most of the gain in female graduate enrollment in engineering comprised of foreign nationals (Laefer, 2009). The result of her study showed that there are fewer women in graduate engineering studies than in undergraduate studies. A study by Berryman (1983) showed that there is a leaking pipeline where women leave the STEM fields in almost all stages of the career path.

As we go further through the pipeline of professoriate, female faculty members in male-dominated STEM fields face challenges. The major problem related to this is once women get

out of the STEM pipeline for different reasons, even if they wish to get back to the workforce, they face a particular set of problems and difficulties. These problems include lack of confidence and out-of-date skills as technology is changing rapidly, structural factors like long working hours and geographical location, and cultural norms within these industries which can make it more difficult for women, especially those with dependent children, to find suitable work (Herman & Kirkup, 2008). What is the reason behind the leaking pipeline? I will categorize the major reasons into three groups: lack of female role models and mentors, family responsibilities, and gender socialization.

Lack of role models and mentors. Finding female mentors and role models in heavily male-dominated fields poses a serious challenge for aspiring female STEM professionals (Tsui, 2010). Female role models who demonstrate that women can be successful and who support other women's success potentially contribute to women's feelings of belongingness in traditionally male-dominated fields (Richman et al., 2011). In the Ethiopian case, since there are very few successful women in different STEM positions, there is a great deal of the problem of lack of role models. Schools have few to no female science teachers who can serve as role models; the same is true for universities. There are very few women in industry and in leadership positions in STEM companies that are known by the larger public.

Although it is believed that exposure to role models in STEM fields can lead toward enhanced self confidence in scientific ability and greater interest in STEM subjects and STEM careers (Weston, et al. 2008, cited in Charyton, Elliott, Rahman, Woodard, & Dedios, 2011), male and female college students cannot list any women scientists or women Nobel laureates in a self-generated list of creative persons. Women were most listed as entertainment celebrities or

artists. On the other hand, these same students were able to list men scientists and Nobel laureates (Charyton et al., 2011).

The role models could be parents, either both parents or a father or a mother. Research has shown that 52% of Nobel Prize winners had one or both parents in similar careers, or an interest in the same field of science, as the Nobel laureate. In contrast, only 17% of the individuals in other professions had parents in similar occupations. Gender of the parent impacted the Nobel laureate's career choice 83% of the time, such that women are more likely to follow the footsteps of their mothers and men that of their fathers (Charyton et.al., 2011). Therefore, the low representation of women in the previous decades influenced the likelihood of women of the next generation to pursue STEM fields. The need for female role models is vital since women form their self-efficacy perceptions primarily from their secondhand experiences and the social and verbal persuasions they receive from others (Marx & Roman, 2002). "Seeing people similar to oneself perform successfully typically raises self-efficacy beliefs in observers, because they come to believe that they themselves also possess the capabilities to successfully perform comparable activities. Women were persuaded that, if others could do it, so could they" (Zeldin, Britner, & Pajares, 2008, p.18).

Furthermore, there is a research finding that in fields with few other women students and few women faculty members, women, on average, may be more likely than men to switch out of those majors once they encounter difficulties, and the Grade Point Average (GPA) of undergraduate women in STEM is higher when there are more female faculty in the fields (Sonnert & Fox, 2012). This shows how effective role models are for the success and persistence of women in STEM.

Family responsibility. In most nations, especially the developing ones, women are more likely than men to perform household labor and childcare. One of the problems in hiring female faculty in STEM fields is limited faculty housing and childcare facilities (Tsui, 2010). When it comes to its impact on their career outcomes, married women are less likely than single women to be tenured, which is the reverse for married men (Charyton et al., 2011). Women who switched from STEM careers said that they were happy with their decision to be in another career, that they found the work to be much more fulfilling than their previous careers, and that their new work was a better balance with their family priorities (Snyder, 2012). In other words, STEM careers are not friendly with women's family responsibilities, because work and family are both highly demanding institutions. There is a notable report of work-family interference, which goes in both directions: work interferes with family/household, and family/household interferes with work (Fox, 2010). Assimaki et al. (2012) also noted that one of the challenges that women faculty in STEM face is the demand of an academic career due to the parallel demands of the role of the woman as wife and mother.

In the case of Ethiopia, the average age of marriage for women is 23.5 (Maps of world, 2013). However, once a woman is married, she is more likely to get pregnant, have children, and will be responsible for all of the household work and childcare (USAID, 2008). All these burdens push married women away from the labor force and hinder the success of those who are already in the labor force. Prior to industrialization, it was possible for Ethiopian women to partake both in agricultural work and child rearing tasks simultaneously. However, with the growth of industrialization, as is the case for many other nations, it became difficult for women to hold both childcare and economically productive work (Roos, 1985). The more children women have, the less they will participate in the economically productive work force (Brewster

& Rindfuss, 2000). Most attention, however, is directed at other problems related to women and marriage, especially early marriage; thus, little attention remains to attend to the problems of married women and their life accomplishments. Ethiopia has one of the highest rates of early marriage in the world, with one in two girls marrying before her 18th birthday, and one in five girls marrying before the age of 15 (Central Statistical Agency & ORC Macro, 2006). However, prevalence rates vary greatly by region and are often higher than national figures, such as in the Amhara region in northern Ethiopia, where almost 50% of girls are married by age 15 (USAID, 2008). Although the Ethiopian constitution explicitly states that "marriage shall be entered into only with the free and full consent of the intending spouses" (The Ethiopian Constitution, Article 34. 2, 1995) and the minimum legal age for marriage is 18 for boys and girls (The Revised Family Code of Ethiopia Article 7.1, 2000), the laws are not always enforced. In a society where using contraception is not a norm, a woman who marries early will have children at the earliest age possible and will keep having children as long as her age allows her to. So, this early marriage prevents them to further their education, and even if they do, their family responsibility hinders them to be successful in their education and in their career.

Early gender socialization. The "cumulative disadvantage theory" (Ma, 2011, p. 1171) deals with the collective effect of barriers women face starting from their early ages. It asserts that early gender socialization leads women to be hesitant toward math and science, which in turn leads to their low expectation for STEM careers, which makes them further disadvantaged in choosing a college major in STEM and even less likely to obtain related degrees. This theory emphasizes that women suffer from higher attrition in STEM fields than men because of the aggregated challenges they face in their life experience (Ma, 2011).

Xu's (2008) study also showed that the underrepresentation of women in STEM is mainly caused by innate differences or gender-oriented socialization. In her study about the turnover and retention intention of women faculty in STEM, she said that even though women faculty are not satisfied with their salary, they suffer more from lower visibility, lower power, and lower support from the leadership, which is directly or indirectly related to gender socialization. More specifically, in engineering and technology, the views and positions of the two sexes differ due to biases about their differing roles, making women's representation in academia more difficult (Assimaki et.al. 2012). Assimaki et.al. (2012) emphasized that the existence of prejudices regarding the female gender, which result in the unequal treatment of women in STEM academic fields, can potentially distance them from these fields.

Residence and College Education

The touchstone of a university education has been thought to be the existence of a community of people with shared norms and values (Brothers & Hatch, 1994). However, it is not easy to develop this community life, which is perhaps the most educative thing that the university has to offer. In this body of literature, a brief history of student residence on college

campuses will be presented, particularly with regard to the educational impact of different on-campus living arrangements.

Historical Overview of Residence in College Campuses

The concept of higher education emerged in the 12th century with the monastic and cathedral schools, which ended with the earliest universities like Oxford and Cambridge (Brothers & Hatch, 1994). Residential facilities, originally referred to as dormitories, were also rooted in these English universities (Marchese, 1986). In the case of Oxford and Cambridge, the student community gradually grew until the number of students equaled the population of the town. Then this gathering of people and construction of more buildings turned to be colleges, which at that time meant a collection of men (Brothers & Hatch, 1994).

When this trend of residence began to operate officially, it was the faculty's responsibility to take care of both the in-class and off-class experiences of students. Due to the need for stronger leadership, there were deans who are responsible for both the administrative and the teaching tasks of the university (Marchese, 1986). As faculty were increasingly expected to be involved in service to external institutions and in scientific research, less time was available for them to spend with students. This brought the need for deans to take care of the administrative tasks and led to the separation of deanship where one dean specializes in student affairs and another in academic affairs and so on (Marchese, 1986). Another major trend occurred in late 19th century and the first half of the 20th century: the enrollment of women and people of color in the universities, which contributed to the expansion of higher education (Marchese, 1986).

Residence Halls to Educate Students

Not all learning occurs in the classroom as a result of formal structured instruction. Residence may have a beneficial effect on students' motivation and can make significant contributions to achieving the educational goals of universities (Marchese, 1986). The quality of out-of-class educational experience is enhanced when residence hall environments are carefully developed and programs available in residence halls are fully implemented (Stimpson, 1994). Students not in halls tend to be less closely involved with student peer groups, and may thus be less susceptible to their influence than are students in residence halls. Peer groups based on halls are rather more likely to consist of cross-section of students in terms of ability and motivation towards work (Brothers & Hatch, 1994). Constantly during their career, students will be assessing their own efforts against others. In halls, if friendship groups are more mixed in motivation, the student who turns to his/her peers for advice is more likely to be recommended to compromise between commitment and laziness. If it is true that students in residence are in genuine contact with people of many different views, then it would be reasonable to suppose that they would be more likely than their peers to have questioned their views on a number of general social issues (Brothers & Hatch, 1994).

Research suggested that students learn as much from one another as from the formal curriculum (Marchese, 1986). Residence halls have the potential to challenge and educate students as they connect their learning experience to their living realities. When residence halls are designed as purposeful educational settings, they can promote effective undergraduate education. Educational potential of residence halls is realized when students are challenged to become more educated human beings both academically and socially (Marchese, 1986).

If college education is to significantly contribute to student learning, it must be innovative. Although residence halls are described as educational, they are primarily social settings; they are part of the institution's educational activities, yet not always in a central way. Like the formal academic curriculum, the residence hall curriculum should reflect the broad goals and objectives of undergraduate education. Thus, residence hall leaders and educators are challenged to form a curriculum that addresses the tasks of teaching and learning (Marchese, 1986). Marchese (1986) suggested that residence halls committed to student learning would focus on the following points:

- Promoting growth and development of students as whole persons with coherent views of knowledge, life, integrity, and intellectual and social perspectives.
- Constructing a residence hall curriculum that teaches students responsibility, altruism, aspiration, persistence, empathy, ethics, and leadership – along with fluency in answering the questions, "Who am I?" and "What will I be?"
- Emphasizing skills that challenge a student's ability to use knowledge in work and leisure: critical thinking and interpersonal skills, as well as technical skills; teamwork, abilities; flexibility; and creative, cognitive, and caring attitudes.
- Creating environments that celebrate diversity by bringing students together in a community where differences are respected, but where there is a common goal to promote learning. (p. 14)

Residence educators must overcome the traditional gap that has existed between academic affairs and student affairs. Residence halls must become purposeful and intentional educational environments. Terenzini and Pascarella (1994) identified that halls with the strongest

impacts on cognitive development and persistence are typically the result of purposeful, programmatic efforts to integrate students' intellectual and social lives during college.

Considering the fact that college residential experience cannot be isolated from other features of college experience (Brothers & Hatch, 1986), Pascarella, Terenzini, and Bliming (1994) conducted a randomized true experiment by controlling other factors to identify the net effect of residential practice on overall college students' outcomes. In their findings, they showed that living on campus will maximize opportunities for social, cultural, and extracurricular involvement of students. Besides, they found that resident students have significantly more social interaction with peers and faculty and are significantly more likely to be involved in extracurricular activities and to use campus facilities as compared to those who live at home or somewhere off-campus. This, according to the study, leads to different levels of satisfaction and social perception between the two groups of students (Pascarella et al., 1994). They also confirmed that students who lived in residence persist more than those who live elsewhere.

In most Ethiopian public universities, undergraduate students are assigned to residence halls depending on different factors. For example, Addis Ababa University accommodates residents in the following order of priority; Disabled students and students with approved medical certificates, female students from outside of Addis Ababa, male students from outside of Addis Ababa, female students from suburbs of Addis Ababa (within the available space), male students from suburbs of Addis Ababa (within the available space), needy female students from Addis Ababa (within the available space), needy male students from Addis Ababa (within the available space), and any students from Addis Ababa are the last priority (within the available space and according to the physical distance of the student's permanent residence).

This shows that in Ethiopia, it is not only a choice to live in residence halls, but also a chance of which university you are assigned to and where your home town is. However, the university investigated in this study provides dormitories for all students because it is located inconveniently out of city with limited access to transportation.

On-campus Living Arrangements and Their Impact in College Education

Given the fact that living in residence halls has several educational and social advantages for college students, it is also important to see how different on-campus residential arrangements impact students' college experiences. Different campus living arrangements can produce different kinds of interpersonal climate and normative peer cultures, which in turn have potentially important implications for how students change during college. Pascarella et al. (1994) discussed two broad groups of residential arrangements: homogeneous and heterogeneous arrangements. In homogeneous arrangements, students are assigned to residence halls based on some common characteristics. They showed two examples of such an arrangement: by academic ability and by academic major. Findings are mixed regarding the impact of such arrangements on student learning. Two studies suggested that students homogeneously assigned to residence halls with same major partners performed better academically than those who were randomly assigned (Shroeder & Belmonte, 1979; Shroeder & Grifin, 1977). Besides, those who were homogeneously grouped by major are significantly more satisfied with their living arrangement than those who were randomly assigned. On the other hand, Moos and Otto (1975), and Croake, Hanson, and Kikland (1980) have found that living in a heterogeneous coeducational residence does not appear to have an appreciable impact on students' academic achievement. Bliming (1993) also suggested that living in a co-educational heterogeneous living arrangement does not affect students' academic achievement. Regarding their social interactions, Bliming's (1993)

study found that students who live in such residence halls have informal and friendship-type social involvement with members of the other gender which potentially reduces stereotypical gender roles.

One residential arrangement most studied for its impact on students' academic and social development in campus is the Living Learning Communities (LLCs). On most educational outcomes considered, it is suggested that residing in an LLC is more educationally beneficial to students than living in a conventional residence hall (Pascarella et al., 1994). As this topic is more related to the original idea of this particular study, it will be discussed in more depth in the following section.

Living-Learning Communities

LLCs have historical roots in the Social Clubs of Oxford University and Cambridge University, and their later incarnations at Harvard, Yale, and Princeton Universities, as intentional communities organized around specific learning objectives. These programs had their beginning with Meiklejohn's experimental college, which existed at the University of Wisconsin from 1927 to 1932 (Nelson, 2009; in Brower and Inkelas, 2010).

LLCs were also a hallmark of the 1970s in student housing. New residence halls were built to include classroom space, faculty office space, libraries and other academic components. These centers provided students with opportunities to take classes, interact with faculty, develop relationships with students in the same field of study, and participate in co-curricular activities that complemented their academic work (Helman, 2000). Later in 1980s, LLCs became extremely popular, and have made a comeback during the past three decades, largely in reaction to several calls for reform in American higher education (Inkelas, 2011). For this and other reasons, a number of higher education institutions in the United States have offered LLCs

tailored specifically to the needs of STEM majors, some for only women and others bringing women and men together (Szelenyi et al., 2013).

LLCs have been described by a variety of phrases such as Residential Learning Communities (RLC), Living-Learning Programs (LLPs), Theme Houses, and Residential Colleges (Inkelas and Soldner, 2011). However, LLCs are different from other learning communities in that they: (a) group students in the program in a discrete portion of a college residence hall, (b) offer participants a common academic experience, (c) involve students in co-curricular activities, offered both in and out of the hall, that are related to the program's learning outcomes, and (d) provide access to unique resources not typically available to other student residents (Brower & Inkelas, 2010; Inkelas & Associates, 2004; Johnson et al., 2006).

Some LLCs are exclusively for women such as Women in Science and Engineering Residential Programs (WISE-R). Such programs group female students who are often in the same science, math, or engineering classes, together in a living center; provide female faculty role models and mentoring; and provide exposure to female alumna who are currently working in these nontraditional career areas (Hathaway et al., 2001).

The Ethiopian undergraduate students' residential arrangement share the fact that all students of similar sex in a similar academic major live together and take the same courses throughout their college experience. In this present study, these two common factors are considered as components of the informal LLC to be investigated on their role for the success of undergraduate women in STEM. Unlike the specially designed LLCs discussed earlier, the LLC in Ethiopian universities do not offer other typical support such as mentoring or research assistantships for the students.

The Role of LLCs for Women in STEM

There is not much empirical research on the topic of LLCs and women in STEM; and of the limited number of studies available, much of the information is derived from National Study of Living Learning Programs (NSLLP). This NSSLP had been conducted twice by a group of scholars led by Inkelas; the first one in 2004, and the second one in 2008. The 2004, NSLLP analyzed LLCs in 34 universities, and the 2008 NSLLP analyzed more than 600 LLCs in 64 colleges and universities across the United States (US). Inkelas (2004), the principal investigator of NSLLP, wrote that she found only three studies focusing on the role of LLCs for women in STEM without using data from NSLLP. As far as literature on the area is concerned, the only existing multi-institutional, longitudinal dataset examining LLC outcomes is the 2004-2007 NSLLP (Szelenyi & Inkelas, 2011; Inkelas, 2011; Szelenyi, et al. 2013). For this reason, existing literature on the role of LLCs for the representation, persistence, and performance of undergraduate women in STEM remains severely limited (Inkelas, 2011; Szelenyi et al., 2013).

Specifically regarding Ethiopia, there are no purposefully designed LLCs of any type in any of the public universities in the country (personal communication with an officer at MoE, July 7, 2014). However, from my own experience as a former student in one of Ethiopian public universities, and the discussions I had with friends, I found something interesting. All of us who went through the residential system in our universities where students of same sex, in a same major, lived together share the fact that our living community positively impacted our academic performance and eased the social and psychological problems that we confronted.

In general, LLCs are thought to provide a more intimate learning atmosphere on an otherwise vast campus, in terms of both enrollment and physical space (Inkelas & Weisman, 2003). These programs link the in-class and out-of-class experience of students by promoting a

smoother learning environment in addition to a friendlier one (Inkelas, 2011). As mentoring positively influences the learning of women more than it does for men (Chesler & Chesler, 2002), LLCs will create a better opportunity for them to survive in the so-called "chilly climate" of the male-dominated STEM fields. In this section, the role of LLCs for the success of women in STEM majors will be discussed in terms of various academic, social, and intellectual outcomes.

Academic performance and social transition. One of the roles of an LLC for women in STEM is that it enhances their academic performance and eases their social transition in colleges. Since social effects and academic performance are usually unified and connected to each other in the perception of college students (Allen, 1999), it is difficult to separate the social and academic effects of residential learning communities. In her study of LLC participants in Iowa State University, Gandhi (1999) found that most women in science and engineering agreed that the most influential factors in their decision to apply to LLCs were related to academic and social factors: acquiring friends within STEM fields and accessing supportive study groups. Women in STEM majors who were involved with women-only STEM LLCs or coeducational STEM LLCs were more likely to express a smooth social transition to college than those who didn't participate in an LLC. Besides, they have more successful adjustment than males in the LLCs (Inkelas, 2011). Similarly, Inkelas (2011) has also revealed that women-only LLC participation has been associated with a successful social transition to college, confidence in mathematics and engineering courses, plans to attend graduate school, and satisfaction with college (Inkelas 2011). Some studies compared the difference in student outcomes of women-only LLCs and coeducational LLCs. For example, in a white paper, Johnson, Soldner, and Inkelas (2006) found that coeducational STEM LLCs are more likely than women-only STEM

LLCs to lead to better outcomes among women, including stronger self-confidence and an easier time transitioning to college academically. Consistent with this, Brower and Inkelas (2010), from their analysis of the 2004-2007 NSLLP, found that students who participated in LLCs felt they made a smoother transition to college, both academically and socially.

This smoother transition to college is an important issue discussed in many studies. In a very recent dissertation study, Belichesky (2013) studied the role of LLCs as an intervention to keep women strong in STEM in a mid-sized religiously affiliated liberal arts university in a large urban area in the US. In her study, she analyzed the role of LLCs in creating an inclusive social environment. Through one-on-one interviewing of women participants in a STEM LLC and after conducting a focus-group discussion with them, she found that their participation provided them a family atmosphere and friendship, which resulted in a smooth transition to college. In this study, Belichesky (2013) has also shown the role of LLCs for women in STEM in creating academic space which promotes their success in such a way that the students will not feel alone during times of academic stress, and will always have faculty and peer mentors who want to make sure they all succeed.

Participants of LLCs or women in STEM agreed that their living community is one in which academics were highly valued and the need for studying is respected (Allen, 1999). LLC participants have higher levels of commitment to civic engagement than non-participants (Johnson et al., 2006). The longitudinal analysis of Brower and Inkelas (2011) has indicated that even a single year experience in LLCs generated lasting effect on participant students. Those students who had lived in an LLC during their first year in college had higher levels of academic self-confidence. Moreover, they were more likely to be a mentor for other students, and remained more committed to civic engagement three years later. In a very general way, it

appears that those students who form satisfactory relationships with those nearest to them in their environment experience greater social adjustment (Helman, 2000).

Gandhi (1999), who studied LPPs for women in STEM in Iowa State University, revealed that students in LLCs were more likely to join or intend to join the campus organizations such as the Society for Women Engineers and the Association for Women in Science. This, she said, indicated a greater desire to become involved on the university campus and that LLC participants were more involved in extracurricular campus activities. Similarly, the LLC in Michigan State University in Helman's (2000) study provided the members with seminars where they discussed academic skills, such as test taking and time management, as well as issues such as learning styles and career exploration. These students were also exposed to a variety of academic resources. As a result, first time enrolled freshmen that participated in the LLC benefited from the social environment created and they had an easier and faster social and academic adjustment than freshmen that did not participate in the LLC.

Participation in LLCs for women in STEM also improves their academic performance; those who participated have significantly higher GPA than non-participants (Inkelas & Weisman, 2003). The study by Gandhi (1999) at Iowa State University has shown that although there was no difference between LLC participants and non-participants on yearly or cumulative GPA, differences were found between the first year GPA and cumulative GPA among those who retained in their STEM majors where female LLC participants in STEM majors exhibited the most significant increase from their first year GPA to their cumulative GPA. It seems that those women who stayed within their major continued to perform at a high level academically. Gandhi's (1999) findings are consistent with another study which was conducted a year later by Helman (2000). Helman (2000) examined the contribution of a residential program for first-year

science and engineering students on their social and academic adjustments. Her findings showed that female LLC participants who took the typical first-semester courses scheduled for entering science and engineering majors had significantly higher semester GPAs than their male counterparts. Similarly, a study in University of Wisconsin-Madison also found that the average first-year GPA of women in science and engineering who participated in LLC was sustainably higher than that of other female freshmen (Allen, 1999).

One problem that women in STEM find challenging is the competitive and individualistic nature of the STEM environment (Hathaway et al., 2000). The group collaboration and engagement created by LLCs may reduce competitiveness among students, which can be detrimental to the success of women in STEM majors (Helman, 2000). Most women who participated in science and engineering LLCs agreed that their community was more cooperative and collaborative than competitive (Allen, 1999). In general, LLCs may provide women in STEM with the needed support and additional direction essential in facilitating the academic, personal, and career success of women in the sciences (Hathaway et al., 2001).

Retention or persistence. Even though mere participation in an LLC may not necessarily facilitate STEM persistence for women, the types of activities undertaken in LLCs (STEM-focused or otherwise) may be the channel of STEM success for women **(**Inkelas, 2011). Women's and men's participation in STEM-focused LLCs was indirectly related to students' likelihood of persistence in a STEM major through the social support provided by the program (Szelenyi et al., 2013). While academic performance is important as it relates to women preparing for STEM fields, university administrators and individual students often use retention as a benchmark of success (Gandhi, 1999). Similarly, the LLC intervention analyzed in Gandhi's study considered the retention of women in STEM academic majors as its main objective (1999).

The study found that students who participated in LLCs were more certain of their own retention and maintenance of their majors than non-participants.

Specifically, for women in STEM majors, those who participated in LLCs were retained at higher levels than non-participants (Gandhi, 1999; Belichesky, 2013). Although LLC participation does not affect women's retention in non-STEM fields, LLC participation significantly predicts STEM major persistence as related to ACT-science reasoning score, math and science self-efficacy, (Gandhi, 1999). Similarly, in their study comparing the retention of female members of science and engineering LLCs to non-members, Hathaway et al. (2001) found that participation in this LLC had a differential influence on science and engineering retention. They found that this program was effective in retaining participant women in the sciences at higher rates than either their female or male counterparts.

Perceptions or intellectual abilities. LLC participants reported greater gains in critical thinking skills and greater enjoyment of challenging intellectual pursuits than resident students who were not participating in a LLC (Inkelas & Weisman, 2003). Women in women-only STEM LLCs were the most likely to express confidence in their math or engineering courses. They reported relatively high levels of academic confidence, and self-efficacy (Inkelas, 2011; Gandhi, 1999). As compared to their counterparts, women in STEM LLCs applied more critical-thinking skills, such as thinking critically about what they read and developing opinions by analyzing the pros and cons of an argument, and took advantage of opportunities to apply knowledge to new settings (Brower & Inkelas, 2010). Johnson et al. (2006) also indicated that the self-reported gain in critical thinking ability of LLC participants was greater than non-participants. Other research indicated that women in science and engineering LLCs have higher levels of satisfaction in their majors, that they feel both comfortable and self-confident in their majors (Allen, 1999).

Generally speaking, students in LLCs were more engaged in key living-learning activities and perceived their environments more positively than non-participants (Inkelas & Weisman, 2013).

Post-college STEM pursuits. Most of the studies on the effect of LLC participation for women in science and engineering focused on the participants' experience in their college years. Only a few studies considered the role of participation in STEM-focused LLCs for women to pursue graduate STEM studies or STEM careers. Attending graduate school in a STEM field is believed to be the ultimate expression of a person's commitment to attaining a STEM education (Szelenyi & Inkelas, 2011). Success during the undergraduate STEM major feeds into the post-college STEM educational pipeline (Sax, 2001). One of the main reasons for women not to go further in their STEM majors is their family role and the belief that it is difficult to balance family responsibility and duties in STEM careers. For this reason, the ability to achieve work-life balance is a professional goal widely documented as holding central importance for women in STEM (Szelenyi et al., 2013). In this regard, LLCs for women in STEM support women's long-term commitment to STEM education by providing them with career information and female role models (Allen, 1999) to support their learning of STEM careers and graduate schools.

Students who received targeted academic advice, were professionally mentored, were research assistants, or those who had another kind of campus science employment were much more likely to persist in STEM through graduate studies and careers (Hathaway et al., 2001). LLCs that provided these opportunities for the participants supported them to the next ladder of their STEM path. Supporting this, Brower and Inkelas (2010) said that positive outcomes were strongest when the LLC integrated research, internship, and service-learning opportunities.

There were other positive outcomes of LLCs for women in STEM. Allen (1999) found that women in women-only STM LLCs at the University of Wisconsin, Madison were satisfied

with their college experience and tended to binge-drink less than the women who were not participants of these LLCs.

Chapter Summary

This chapter presented the review of related literature on the topic of Ethiopian women in particular and women in STEM in general and the role of college residence for student success. It discussed the barriers for women's participation in STEM fields from different perspectives such as gender-based barriers, and structural barriers, and under each perspective, several specific barriers were discussed. Under the other broadly discussed topic, residence and college education, the historical overview of residential halls and their roles to educate students was discussed. More importantly, on-campus living arrangements are discussed with special emphasis on LLCs and their roles for women in STEM majors. Among the benefits of living in LLCs discussed are increased academic performance and easier social transition, better retention or persistence in major, more positive perceptions and higher intellectual abilities, and better post-college STEM pursuits.

Chapter Three: Research Design and Procedures

This study investigated the experiences of women in science and engineering in their residential community and the role of this community for their academic and social integration leading to successful college completion. It was designed to answer the research question "What role, if any, does the residential community of undergraduate women in science and engineering majors play for their academic and social integration and overall college success?"

This study employed a qualitative methodology using exploratory case study methods. In order to make the results more valid, multiple data sources were used: one-on-one interviews with three different groups of participants, student records from the university's registrar office, and other relevant official documents.

Theoretical Framework

A residential environment integration model was developed by adopting Tinto's (1975) integration model. The study is mainly guided by the newly adopted model of residential environment integration while data coding and analysis was guided by Third World Feminist Theory. Tinto's theoretical model, first developed in 1975, emphasized the importance of various individual and institutional factors that support students' social and academic integration for their success in higher education. Among the various institutional factors, the present study emphasized college residence halls as a component of the institution.

Tinto's Integration Model.

Tinto's (1975) model considered multiple factors for student attrition or retention. The model was used to explain the causes of student outcomes (Berger & Braxton, 1998; Metz, 2004, Berger, 1997). Even though Tinto's research (1989, 1993, 1997) continues to be prevalent in much of the literature on student departure, many studies, including this present study, used the

1975 model as a starting point in their investigations into student persistence and attrition. His work described the complex interactions between individual students and the campus environment, suggesting that the fit between the student and the environment involves both social and academic integration in the institution. Academic and social integration, where the student is immersed in the many dynamics of college life, formed the basis for Tinto's 1975 Model (Metz, 2004). Academic integration relates to academic performance, involvement with the curriculum, and contact with faculty and staff, while social integration relates to involvement with peers, faculty, and campus activities (Walter, 1997). The concepts of social and academic integration in college have also received much attention in replication studies of Tinto's model for retention and other college outcomes. However, there are some components of Tinto's model that doesn't apply in the context of Ethiopian higher education system. For example, commitment to institution is one component of the model which asserts that students develop initial goal and commitment to their institution based on some background characteristics such as their gender, ethnicity, and class, and this commitment grows stronger as the students integrate to the college environment. However, commitment to institution is not a component that concerns students in Ethiopian higher education system. This is because, once students are assigned to a university and/or a specific major, they cannot move to a different one; the only options they have are staying committed to their university and major, or leave the institution. In such cases, students may attend private universities which have easier requirements for admission as far as the students can afford the tuition. For this and other differences in the Ethiopian higher education system, this study cannot directly apply Tinto's (1975) model as a framework. Therefore, a new more applicable model, a residential environment integration model (Figure, 1),

is used as a framework by using a portion of Tinto's model that has real significance to the context of the Ethiopian Higher education system.

Tinto (1975) asserted that every campus is composed of multiple communities, any one of which could provide a way for a student to become integrated into campus life. For this particular research, the community that will be mainly investigated for its effect on student integration is the residential community with some consideration of the students' in-class experiences. In Ethiopian public higher education institutes where students of same major and same gender live in the same residence halls and dormitories, it is very difficult to isolate the students' residence hall experiences from their in-class experiences.

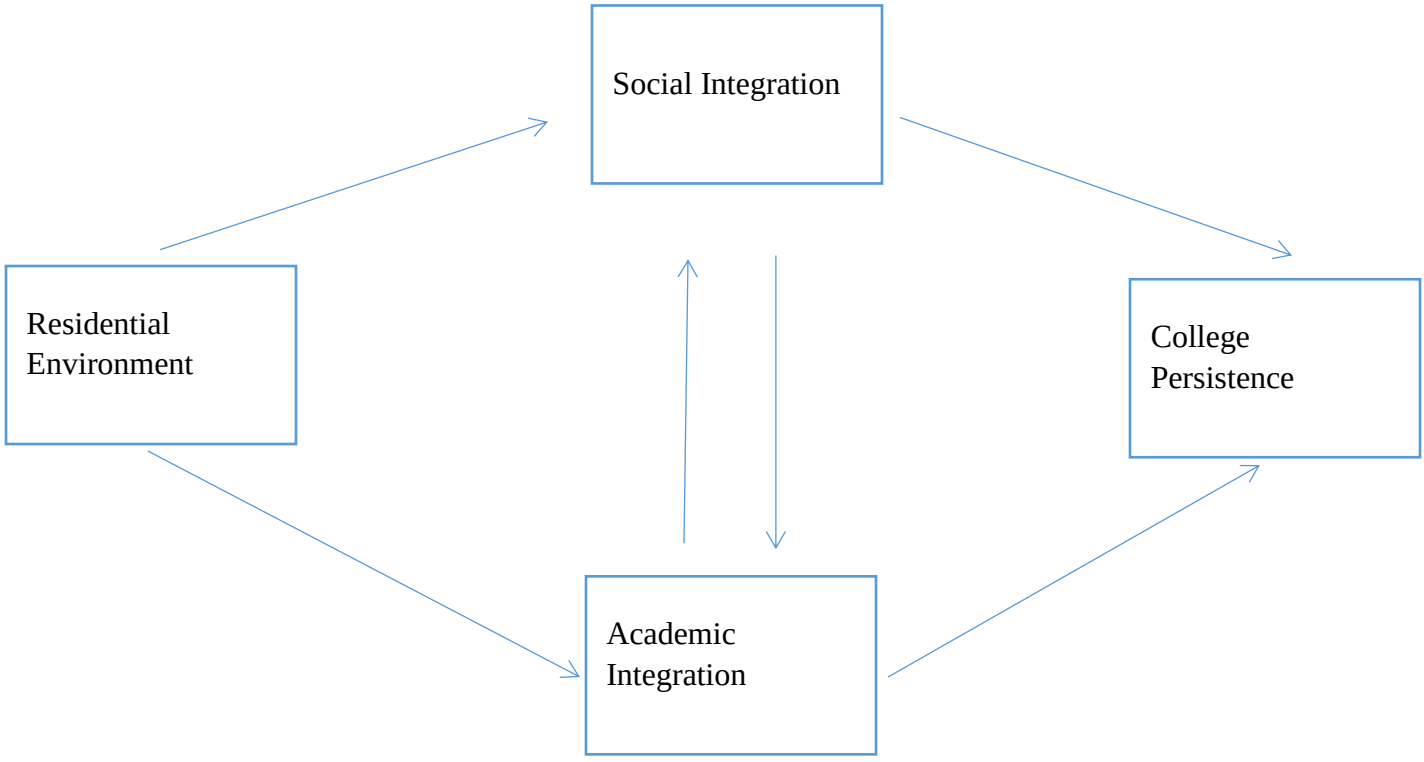


Figure 1. Integration Model of Residential Environment

A study showed that students' academic and social experiences are comprised of a formal and informal system (Lundy, 2010). The formal academic system pertains primarily to the

student's academic performance, whereas the informal system is related to students' interactions with faculty and/or staff members. Likewise, the formal social experiences include students' participation and engagement in extracurricular activities, whereas informal social experiences include peer group interactions (Lundy, 2010). Similarly, this present study considers the importance of both the formal and informal interactions that the students make in both their residence and in-class environments as important components in the integration process.

The social and academic experience of students in their institution contributes to their corresponding academic and social integration. Tinto (1993) stated that, along with the context of students' pre-entry attributes, initial commitments, and institutional experiences, academic and social integration influenced their subsequent commitments to the institution, including the goal of degree attainment. The greater students' level of academic integration, the greater their subsequent level of commitment in terms of completion. A similar, positive relationship is expected for social integration and subsequent levels of commitment to the institution (Tinto, 1993). According to Lundy (2010), academic integration is comprised of two dimensions — structural and normative — that coincide with the formal and informal systems. The structural aspect of academic integration entails meeting explicit standards of the college or university, whereas normative integration pertains to an individual's identification with the beliefs, values and norms inherent in the academic system. In terms of social integration, Tinto (1975) focused on the degree of alignment between the individual student and the social system of an institution. Social integration reflects the student's perception of his or her degree of congruence with the attitudes, values, beliefs, and norms of the social communities of a college or university. Student integration, in both the academic and social realms, then influences subsequent commitments to

the institution. Accordingly, the greater the level of subsequent commitment to graduation and the institution, the greater the likelihood the student will persist to degree completion.

Although many agree that the implications of Tinto's model for college preparation programs are quite significant, there is still a concern about this model (Guiffrida, 2006; Tierney, 1999). The biggest concern is the failure of Tinto's theory to recognize cultural variables when applied to minority students. According to some critics (Guiffrida, 2006; Hurtado, 1997), Tinto's assertion that students need to dissociate from their past community to fully integrate into the college's social and academic settings fails to recognize cultural variables (Tierney, 1999). Their argument is that minority students' cultural backgrounds often "differ from the Eurocentric frameworks upon which the norms and values of predominantly White institutions are based" (Guiffrida, 2006, p. 451). In the case of this present study, women are minority in the male dominated STEM fields. The use of Third World feminist perspective — emphasizing that women in that particular setting have their own shared values which might be different from what is expected in the male dominated STEM setting — will help to address the concern regarding Tinto's model for disregarding individual cultural variables by interpreting the women's experiences as a unique experience of their own.

On the other hand, some argue that Tinto's integration model has some similarities with Astin's (1985) involvement theory in that both asserted that students, willingly or unwillingly, become involved in different college activities and the extent of their involvement in the college environment affects their potential and willingness to persist (Metz, 2004). Astin is also known for his input-environment-output (I-E-O) model of student persistence, which is also one of the first attempts to explain student persistence in colleges (Isher & Upcraft, 2005). The general concept of the I-E-O model is the notion that student success is a function of students' identities

prior to college and what they experience in college (Astin, 1991). This input factor is similar to Tinto's model. However, the two are different in many ways, including their emphasis on specific contexts and the way they interpret the effect of environment. For example, Astin did not consider the interaction among different input and environment factors to determine student outcomes, while Tinto focused on how different environmental factors can interact and affect students' integration in college campuses both socially and academically. On the other hand, Astin has a broader context of student outcomes (e.g. retention, academic performance, pattern or intent to switch from major, etc.), whereas Tinto's exclusive focus was the student's decision to drop out.

In the case of the present study, the campus residential environment that the students lived in is given major emphasis as the environmental component for the integration process, with some consideration of their in-class experiences. Berger (1997) had a similar approach for his study on freshman students' sense of community in residential halls, their social integration and its role for first year persistence where students' sense of community in their residence halls was a source of social integration and a precursor to their departure decisions. Although Tinto's studies (1975, 1989, 1993) and several other studies showed the importance of different components of the college environment for students' social and academic integration, no study, other than Berger (1997), examined the importance of a specific campus community to investigate how they do or do not affect the integration process. This present study contributes to literature in this area. The specific model developed for this study (Figure 1) is a variation of Tinto's model that investigates a specific residential environment experience of women in STEM in a public university in Ethiopia. In this model, the residential environment is considered a major attribute for social and academic integration to take place. This study will explore the

academic and social systems in the residential environment and the students' interactions in these systems to understand how they influence women in STEM to persist in their major and complete their degree.

Third World Feminist Theory

The term *Third World feminism* first came in use in 1981, in Gloria Anzaldua's work, which is recognized by many as the first explicitly self-defining Third World feminist text (e.g. Mohanty, 1991; Roberts, 1983). The term *Third World* is frequently applied in two ways. One is to refer to underdeveloped countries or continents where the majority of the people live in extreme poverty; and the second is to refer to oppressed nationalities (Johnson-Odim, 1991). Narayan (2013) also highlighted that oppressed people in developed countries also consider themselves, their communities, and/or their politics as Third World because it is through this that they show similarities in the locations of and problems faced by their communities and communities in Third World countries. That is the reason many Third World feminists use the terms "Third World women" and "women of color" interchangeably (e.g. Anzaldua, 1986; Mohanty, 1991).

Another type of feminism, which is usually talked about in the discussions of Third World feminism, is transnational feminism. Both Third World and transnational feminisms have emerged in opposition to White second-wave feminists' generalized analysis of gender oppression that ignored Third World women's multiple and complex oppressions in their various social locations (Mohanty, 1991). White feminism is described in various ways in the literature. Some authors used the term interchangeably with Western feminism (Narayan, 2013), mainstream feminism, second-wave feminism; some add either of these two to the main word "White" (i.e., White mainstream feminism, or White second-wave feminism) (Herr, 2014;

Mohanty, 1991). In all cases, it is used to express the advantaged groups of women in different context such as race, social class, or nationality. For our discussion in the present study, this type of feminism will be described as White feminism.

Third World and transnational feminisms oppose the ideologies of White feminism that all women everywhere face exactly the same oppression merely by the virtue of their gender (Anzaldua, 1981; Herr, 2014; Mohanty, 1991). In this regard, Mohanty (1991) critiqued that White feminism characterizes Third World women's oppression as merely a worse case of gender oppression and the wrong universalism presupposed by White feminism. Rather, scholars of Third World feminism emphasized that Third World feminism focuses on Third World women's complex and intersecting oppressions and multiple forms of resistance (Herr, 2014; Mohanty, 1991). Herr (2014) articulated two shared mandates of the two types of feminism. First, she said, feminist analyses of Third World women's oppression and resistance should be historically situated. Second, Third World women's agency and voices should be respected. Herr (2014) also wrote details about the difference between these two types of feminisms and she emphasizes that their difference lies on their domains of investigation. Explaining this, she said that Third World feminism focuses on "women's activism in their particular local/national contexts" while transnational feminism is primarily interested in "feminist organizations, networks, and movements occurring outside and beyond individual nations at the transnational level" (Herr, 2014, p. 2).

Mohanty, in her book Third World Women and the Politics of Feminism (1991), describes Third World feminism as "imagined communities of women with divergent histories and social locations, woven together by the political threads of opposition to forms of domination that are not only pervasive but also systematic" (p. 4). She argues for the idea of an

imagined community instead of a fixed, static community because the daily lives of Third World women are so different, yet there are clear links between them that are united through political struggles. Mohanty (1991) says, "the idea of imagined community is useful because it leads us away from essentialist notions of Third World women struggles, suggesting political rather than biological or cultural bases for alliance" (p. 4).

Unlike the mainstream White feminists, Third World feminists theorize about the intersections of sexism, colonialism, imperialism, race, ethnicity, class, development, poverty, and culture, while at the same time providing a critique of mainstream White feminism. From what is said so far, Herr (2014) stipulated what she called "a more precise definition of Third World feminism":

> Third World feminism encompasses feminist perspectives on Third World women that (1) generate more reliable analysis of and recommendations for addressing Third World Women's multidimensional and complex oppression through careful examination of their local conditions in their historical specificity and (2) respect the agency and voices of Third World women engaged in diverse forms of local activism. (p. 6)

Third World feminists still agree that women in different Third World nations may have diverse needs based on the context of the nations but for Third World women, whether in the advanced capitalist or developing world, oppressions are interrelated, not hierarchically situated (Mohanty, Ruso, & Toress, 1993). They argue that Third World women cannot see gender equality in isolation of the wide range of issues affecting their lives; because for them, while the "personal is political," the political is also personal (Hurtado, 1989; Mohanty, 1991, p. 1; Mohanty, Ruso, & Toress, 1993). Mohanty (1991) further explained this in terms of the political being personal, women and men experience the same dehumanizing elements of poverty,

unemployment, and racism as domination and exploitation, though gender results in a differential experience of these oppressions.

Most of the feminist theories on women in STEM, including the popular feminist standpoint epistemology, narrate about the experiences of STEM women in the US context. This study, on the other hand, tries to address the issues of STEM women in Ethiopia. Third World feminist theory identifies that women in their localities have different kinds of oppression and the various oppressions which are unique for women in Ethiopia are discussed in the previous chapter. However, it is still important to mention the importance of interdependence in the Ethiopian social context and how getting social acceptance is a big deal of identity. In some cases, certain practices which are perceived normal in other cultures, e.g. chewing gum, wearing pants, wearing lipstick, and in a worse case, smoking cigarettes, could be potential discriminatory factors for Ethiopian women. As a result, a woman needs to be aware of what she does and how she acts in order to be socially accepted in the community. Therefore, when we talk about social or academic integration in college residences we should acknowledge these unique features of the Ethiopian community and the extra factors that the women need to be cautious about. Furthermore, acknowledging the uniqueness of this experience helps to interpret the responses of the participants as their own unique lived experience. Third World feminist perspective helps as a tool to address this concern.

One of the reasons for the need to discuss Third World feminism is to emphasize that any movement for liberation and social change in the Third World can be strengthened only by the participation of the women at all levels (Jayawardene, 1986). In the same way, any development strategy needs the full participation of women at all levels. The STI policy in Ethiopia, is not any different; it needs as much women as men to take part in the science, technology and innovation

to bring the country out of poverty. Women suffer more from poverty than men do. In a poor country like Ethiopia with great emphasis on science and technology as a tool to bring development, women's participation in STEM frees themselves from exploitation by unpaid or underpaid gender roles, oppression due to economic independence, and patriarchal structures that resulted from the exploitation and oppression.

Raising this point is important because while demanding for equal participation in, and benefit from the development effort, Third World women have to negotiate with traditionalists and political conservatives who think that feminism is a product of Western capitalism and that it separates women from their culture, religion, or family values (Narayan, 2013). Similarly, when it comes to STEM education in Ethiopia, it is traditionally considered as men's and if women participate in STEM fields, they face discrimination and feel lack of sense of belonging. A woman who outperforms in those fields is still considered as unique and manly and STEM fields are not believed to be a good fit for women. Even the very few women who managed to pass all these barriers and pursued STEM carriers need to work much harder than their men counterparts to prove their competence in their profession. Thus, bringing the idea of equal participation of Ethiopian women in STEM fields needs negotiation with, the policy makers, the society at large, and the women themselves.

Feminism in Ethiopia. As this study is based on an Ethiopian context, it is important to briefly discuss the country's history and current situation with respect to feminist activism. Ethiopia is the second largest country in Africa, with an estimated population of nearly 94 million and growth rate of 2.9% per year. It is one of the poorest countries in the world and ranks 141 in the Human Development Index (United Nations Development Program UNDP, 2009). When the concept of feminism comes to Ethiopia as a Third World nation, it is not much

different from what has been described in the literature. Like many other Third World countries, in Ethiopia, a woman's identity is linked to her family and the prescribed gender role as a mother and homemaker, yet throughout Ethiopia's history there are examples of women who have roles that extend beyond the home and family into public and political life (Burgess, 2013). One example is Empress Taitu, who is always honored in the country's history for the heroic roles she played to defeat Italian invaders in the late 19th century. The emergence of women's organizations in the modern sense dates back to the early 20th century. The first nation-wide organization was the Ethiopian Women Welfare Association, founded in 1935, by the then Empress Menen to raise funds and sponsor projects for urban women in the capital Addis Ababa (Mulugeta, 2010). Such women's organizations grew stronger in a variety of contexts throughout the history of the nation; during war times, or political unrests, or peaceful settlements.

After the current governing party started to rule the country in 1991, it endorsed a national policy on women and set up Ministry of Women's Affairs at the federal level, Women's Affairs Bureaus at regional levels, and Women's Affairs offices in all government organizations. The name has recently been modified to Ministry of Women's, Children's and Youth's Affairs and organizational offices are now called Gender Affair Offices instead of Women's Affairs offices. In addition to these governmental entities, a number of women's civil society organizations and networks of women's associations have also emerged in this period. Despite all these efforts, women's place in public and political spheres is still marginal. It is always present and has increased with changing political systems, though. Ethiopia is not a country that has figured very much in international research. Outside of the country, little is known about its history. In particular, little is written about the place of women in different spheres, particularly with regard to the emergence of women's activism in the country. This makes it difficult to

broaden the discussion on the topic. One general truth, however, is that women in Ethiopia are still in the disadvantaged margin in different respects including access to education, health care, employment, economic advantages, and/or political participation (Biseswar, 2008; Burges, 2013; Concern World Wide, 2013).

As is described in previous sections, Ethiopian women face challenges that are very different from what women in other parts of the world could face. For example, when it comes to access to education, it is taken for granted for women in the US, but for a young Ethiopian girl, it means passing several barriers like poverty, early marriage, and/or abduction. The women I talked to have managed to complete all these different stages of barriers and they've managed to be in a family that has kept them physically and martially safe – to get to this place, which is not a thing in every culture. Once they pass all the barriers and make it to college, especially when it comes to participating and succeeding in STEM fields, the floor is more leveled for women in the US than it is for Ethiopian women because they need to worry about which field they will be assigned to, the stereotypes from multiple directions, the extreme lack of role model, and the inexistence of support system make it worse for the latter group. Therefore, it needs a different lens to interpret the participants' experiences in their own unique context instead of considering it the same as women anywhere in the world. Thus, for the purpose of this present study, Third World feminist perspectives will be utilized so that the participants' experiences will be considered unique in regards to the specific institutional, regional or national situation where they passed through.

Research Methods

Case Study

A case study is one of several qualitative methods for conducting research in the social sciences (Stake, 2005). Case studies can focus on a single case or multiple cases. According to Yin (2014), case studies are necessary to understand complex social phenomena. They are common strategies in qualitative research and contribute uniquely to our knowledge of different phenomena (Yin, 2014). When we say a case, it can be simple or complex; in the context of research in education, it may be a case of a single child or a case of the entire classroom of children (Stake, 2005). When conducting a case study, researchers must extensively examine how things get done (Stake, 2005). In the case of the present study, understanding how undergraduate women students in STEM are assigned to college residences and their interactions in the residence halls retain the holistic and meaningful characteristics of real life experiences in campus residence halls.

According to Yin (2014), case study is most appropriate to answer "how" and/or "why" research questions, yet it also answers "what" research questions when the study is exploratory. Since this study is exploratory in nature, the case study method was appropriate to answer the "what" question of the research. Case studies require no control over behavioral events and focus on contemporary events (Bogdan & Biklen, 2007; Yin, 2014). Likewise, the present study had no control over events and focused on contemporary experiences of undergraduate women in campus residences. This signifies the appropriateness of case study method for this study.

Case study methods have been critiqued by some researchers who argue that it lacks rigor in such a way that the researcher will be sloppy, allowing biased views to influence the direction of the findings and the conclusions (McMillan & Schumacher, 2009; Yin, 2014). Yin (2014) also

said that case study has little basis for scientific generalization. However, case studies are generalizable for theoretical propositions and not to populations and universes (Yin, 2014). Though not possible to make statistical generalizations, it is possible to make analytical generalization, which is generalizing a particular set of results to a broader theory (Bogdan & Biklen, 2007; Yin, 2014). In this present study, as it is not possible to isolate one feature of the total college experience from another, no cause-effect relationship will be presumed from the analysis.

When it comes to maintaining validity and reliability, lacking the certainty of hard numbers and p values, qualitative inquiry, including case studies, expressed a crisis of confidence from many directions (Morse, Barrett, Mayan, Olson, & Spiers, 2002; Tobin & Bogley, 2004). Like any other research method, case study is also concerned about the validity and reliability of the study. For this present study, the researcher made sure that both reliability and validity were attained to a satisfactory level throughout the study. As the validity of a research depends on the amount and type of evidence there is to support the evidence, and it is enhanced by using a variety of instruments to collect data (Frankel, Wallen, & Hyun, 2012); multiple data sources were used and a chain of evidence were established to strengthen the validity of this study. The students' responses were cross-checked with the responses of resident proctors and that of officials from the university and MoE. At the same time, data from the registrar's office on students' records were compared with students' answers to questions regarding gender composition and student achievement gaps between the two gender groups. Similarly, reliability is assured as the participants expressed their own thoughts and lived experiences in their own words, which makes the results very consistent (Frankel, et. al. 2012; McMillan, and Schumacher, 1997). In general, this present case study showed what roles a

residential environment plays for the social and academic integration of undergraduate women in STEM and for their overall college success.

Research Location and Setting

The study was conducted in a public university located in Addis Ababa, Ethiopia, at the heart of the industrial zone of Kaliti − Akaki sub-city. The establishment of the university was the result of a five-year growth and transformation plan of the Ethiopian government. This plan emphasized building the capacity of science and technological institutions, which included establishing eight new general universities, two Science and Technology Universities and ten Institutes of Technologies (University Student Handbook, 2011). The establishment of this university in 2011 was part of this plan, which makes it one of the two special universities for science and technological studies in Ethiopia. The university is expected to be one of the largest universities in the country with a large number of undergraduate and graduate enrollment.

The university has 11 schools; each has different departments, which offer undergraduate degrees. Some of the departments also offer graduate degrees (see Appendix C). This university was selected for the study because all STEM majors are available in one campus, which is not common in most other Ethiopian universities, and because it is one of the special science and technology universities, which the government established.

At the time of data collection (summer, 2014), there were more than 10,000 students enrolled in the university. All of these students live in on-campus dormitories organized by departments; four students live together in one room. Each dormitory is furnished with a bed, lockers, reading chairs, and a table. For newly assigned students, dorms are allocated prior to the arrival of students based on the data from MoE. Dormitory assignments are renewed and

guaranteed every academic year, according to the number of students matriculated to the next academic year.

The university was purposefully selected for being recently established and for having a large variety of science and engineering fields all in one campus. In most universities, there are different campuses for every college under it. For example, Addis Ababa University has seven campuses, one in each of the following areas of study: social studies and humanities, science, engineering and pharmaceutical sciences, architecture and construction management, veterinary medicine, medical science, and business and economics. Some are geographically close to each other, while some are very far apart. If this study were conducted at such a university, the geographic disparity and administrative politics would make the study hard to manage. Therefore, having all the students in all science and engineering fields in one campus made the research more feasible.

Participants

There were three groups of participants in the present study: undergraduate women, freshman to senior year, majoring in STEM fields enrolled under the regular program in a public university in Ethiopia; resident proctors for women's buildings; and higher officials in the university and Ministry of Education.

Student participants were recruited after they were notified about the study through a poster in their residence halls, university research boards, and departmental offices. Participation was voluntary and only a few students volunteered to participate at first. Therefore, I used snowball sampling to recruit more participants. The first participants who volunteered to participate registered at the office of Students' Council and were scheduled for the interview. The interviews were conducted in the office that I was given to stay for the duration of my data

collection. At the end of each interview, the participants were asked to invite other participants by telling them about the research. I stationed in the same office the entire time so that anyone interested could come and schedule an interview. Each interview with the student participants lasted, on average, for 22 minutes. I considered variation in major and year level when inviting these participants, which helped me to maintain balance and variety (Stake, 2000). Considering variation also helped to attain information-rich cases, and increased the utility of information obtained from a small sample (McMillan & Schumacher, 2009).

To show the other side of the problems and prospects, university and other Ministry of Education officials were purposefully selected based on the relevance of their positions to address the research question. I researched which officials worked closely with students' relations and their residences. I selected the higher education coordinator from Ministry of Education, as well as two university leaders: the Administrative Vice-president and the Head of Gender Department. Each of the three participants was then interviewed individually for a duration ranging from 30 minutes to an hour.

To recruit the residence proctors, I first contacted the head of the proctors who volunteered to participate and she helped me contact the other proctors. I then recruited four proctors who volunteered to participate and interviewed them on a one-on-one basis; each interview lasted approximately 15 minutes.

Data Collection

As the study is a qualitative study mostly utilizing interviews, trust should be developed between the researcher and the participants. This is also very important for the present study since it examined females' experiences in STEM by focusing on the students' perceptions. Supporting this, Taylor and Bogdan (1998) advise that researchers should be clear with research

participants about their role in the field during data collection. Therefore, I was explicit and explained to the university administration, and to all my participants, that my role in the university will only be that of a researcher. I told them that I do not work for the university, or for the MoE, or any other government organization in Ethiopia; that I am a graduate student in a university abroad, which is not affiliated to the government of Ethiopia in any way. By explaining that I was independent of the government and the university, I hoped participants would feel less risk in sharing their experiences.

Participation was voluntary and students who chose to participate signed up at the Office of Students' Council where they scheduled the interview at the same time. Proctors and officials at the university and at MoE were recruited through personal invitation.

Interview. The study mainly relied on qualitative data from interviews with different groups of participants. The interviews explored the role of the residential environment of the university for the social and academic integration and overall academic success of women in STEM majors. Three groups of participants were interviewed for the study: undergraduate female students in STEM majors in the university, residential building proctors for female students, and relevant officials both at the university and Ministry of Education. In order to let the participants express themselves to the greatest extent with no language barrier (Bogdan & Biklen, 2007; Creswell, 2012), the interviews took place in Amharic, the official language of federal government organizations in Ethiopia. To examine the personal experiences of students in their residence halls and in classroom settings, all participants were interviewed in a one-on-one basis. In order to explore what efforts the government directed at placing women into STEM fields and employing affirmative action to hire more women faculty in university teaching, officials both in MoE and in the university were interviewed. The higher education coordinator

of the MoE, officials responsible for students' affairs in the university and the Administrative Vice-president of the university who was in charge of students' affairs at the time of data collection, and the gender office coordinators of the university were also interviewed. Before conducting the interview, a semi-structured interview checklist was developed (see Appendix D).

Table 1

Data Tools and Sources

No.	Method Used	Data Source	Data Format
1	Interview	- Students - University officials - Ministry of Education officials	Audio transcript
2	Document analysis	- University registrar record - Ministry of Education relevant policy documents	Written materials

Data Analysis

The interviews were transcribed from the audio recording of the discussions by converting the voice into Amharic text and then translating each word directly into English (Bogdan & Biklen, 2007). Whenever there were words that do not have equivalent meaning in English, I consulted other speakers of Amharic and linguists in the language to find a closer meaning of what the respondent meant to say. For example, there was a time where a participant mentioned a girl with an acceptable behavior using the Amharic phrase "ምንም የማታውቅ የቤት ልጅ" which literally means, "a house kid who knows nothing". However, this phrase was translated in the transcript as "a girl who goes by the social norm and acts in a socially acceptable manner". Another example is how a student participant mentioned her dissatisfaction in her major by saying "ኑሮ ካሉት መቃብርም ይሞቃል". This is an Amharic idiomatic expression and its literal

meaning is “if you call it life, a grave can be warm”. But the real meaning of the phrase is “when there are no options, you can even accept the unbearable”.

Once the transcript was translated, I cleaned the data by omitting words, phrases, and unnecessary repetitions that would otherwise make it difficult to follow the conversation (McMillan & Schumacher, 2009). I then read and re-read the transcripts while listening to the audio as I coded the data. Data were coded in two cycles to make a critical link between the data and their explanation of meaning (Bogdan & Biklen, 2007; Saldana, 2013). Then, to better understand the data and to make links among different respondents, I identified repetitive patterns (Saldana, 2013). For example, several of the students mentioned male dominance, different ways of grouping in classes, peer-interaction, faculty-interaction, and challenges they faced. Therefore, I needed to group similar patterns like these in a theme. I identified several themes and evaluated which ones had most support in the data, and finally ended up with four themes. These four themes are the ones reported in the findings.

Data from the interviews were analyzed through a Third World feminist critical lens that privileged the voices and experiences of the participants as their unique voice and experience. The qualitative data from interview, which were coded to determine patterns and themes, were triangulated with data from document analysis.

To insure the anonymity of the participants, all the names used in the analysis are pseudonyms assigned by the researcher. Also, throughout the analysis, acronyms are used to describe which group of participants is quoted. The acronym “SP” denotes Student Participant, “RP” represents Resident Proctor, “UR” represents University Representative, and “MR” denotes MoE Representative.

Positionality

I see myself as both an insider and an outsider for this particular study. I am an insider for the Ethiopian education system and was once on the shoes of the student participants. I was born and raised in Ethiopia, I speak the language spoken by most of the Ethiopian population, I went through elementary, secondary, and post-secondary education in Ethiopia. My insider status informed me about places and personnel in the Ethiopian system from which to gather data for the study (i.e. the university, MoE, proctors, gender officers, etc.). Additionally, I know the social and communication norms in Ethiopia (e.g. dress code, approaching officials and introducing myself). However, I am a researcher and I need to be neutral in interpreting what the students said. Therefore, starting from designing the interview questions, I tried to avoid directive questions. For example, instead of asking the students a "what is the advantage of living with same-major roommates" I asked an open-ended question "How do you describe your dormitory experience?" (see Appendix D). At the same time, I probed the students with responses that need more clarity so that my insider knowledge does not interfere with interpreting the students' responses in the way I perceived it. For example, when a student mentioned having a boyfriend or wearing chap sticks as a bad practice, I asked follow up questions as "what do you think is wrong with having a boyfriend …". By doing that, I minimized any bias my insider status could cause in explaining the findings and the conclusions.

Chapter Four: Findings and Discussion

Introduction

This study investigated how residential environment affects the social and academic integration of undergraduate women in STEM in an Ethiopian public university with more emphasis on the importance of the interaction between campus communities and the individual students. In addition, it added empirical evidence to support claims of the importance of community and positive sense of community in university campuses for their degree completion.

This chapter presents the demographics of participants and the patterns found after analyzing the data collected through one-on-one interviews with female students in STEM majors, interviews with relevant officials in the university and in Ministry of Education, interviews with female residential building proctors, and a collection of university registrar documents. Data were collected to answer the research question guiding this study: What role, if any, does the residential community of undergraduate women in science and engineering majors play for their academic and social integration and overall college success?

Data collected for this study were analyzed through a Third World feminist lens by making the voices of the female students heard and drawing the analysis from what they experienced as female students in male-dominated fields, using their own words. Their experience was considered unique with regard to the specific institutional, regional or cultural situation where they lived. Through an ongoing process of coding, categorizing and recategorizing (Saldana, 2013), I identified the following four themes for analysis and discussion: (a) gender relations and stereotypes; (b) students' self-perception and commitment to major; (c) students' relationships with others; and (d) college experience. The theme about gender relations comes first because women are the core of the study and all their experiences

shared in this study are influenced, in one way or another, with their gender identity. Then, the students' self-perception and their relationship with others come consecutively as they determine the way the students entertain their overall college experience and their experience particular to their major. Their college experience is then discussed, which includes much of the discussion on the main challenges of the women to integrate in the overall campus environment. The documents from the university's registrar were also analyzed and incorporated in the discussion of the themes. I used simple statistical analysis to describe percentage composition, dropout rates, and persistence patterns in their major. In this chapter, the findings are organized by the four themes outlined above.

Participant Demography

There were three groups of participants in this study: female undergraduate students in STEM majors, women resident proctors for girls, and relevant officials from the university and from MoE. Fifteen female students, five female resident proctors for girls, two university officials, and one MoE representative participated in the study. The students represented diverse majors in STEM fields, and they were at different stages in their degrees, from freshman to junior years. While most were from Addis Ababa, the students represented different regions in the country. The following tables summarize the demographics of the three groups of participants.

Table 2

Demography of Student Participants

Pseudonyms	Major	Choice	Year of Study	Regional Background
Seble	Electrical Engineering	1st Choice	Sophomore	Addis Ababa
Kalkidan	Manufacturing Engineering	1st Choice	Junior	Bahir Dar
Martha	Computer Science	2nd Choice	Sophomore	Addis Ababa

Rediet	Civil Engineering	2nd Choice	Junior	Addis Ababa
Eyerus	Food Process Engineering	3rd Choice	Sophomore	Not from Addis Ababa
Bethel	Food process Engineering	2nd Choice	Sophomore	Addis Ababa
Efrata	Chemical Engineering	4th Choice	Sophomore	Not from Addis Ababa
Rahel	Manufacturing Engineering	2nd Choice	Junior	Addis Ababa
Bezawit	Electromechanical Engineering	1st Choice	Junior	Addis Ababa
Menbere	Environmental Engineering	3rd Choice	Sophomore	Not described
Meseret	Public Health	2nd Choice	Sophomore	Far from Addis Ababa
Rawda	Electrical and Electronic Engineering	2nd Choice	Sophomore	Addis Ababa
Markan	Water Supply and sanitation Engineering	1st Choice	Freshman	Addis Ababa
Nigisty	Computer Science	4th Choice	Sophomore	Mekele
Hanan	Mechanical Engineering	3rd Choice	Junior	Addis Ababa

Table 3

Demography of Resident Proctors

Pseudonyms	Position	Gender
Almaz	Resident Proctor	Female
Hagere	Resident Proctor	Female
Sisay	Resident Proctor	Female
Beza	Resident Proctor	Female
Zebider	Resident Proctor	Female

Table 4

Demography of University and MoE Officials

Pseudonyms	Position	Gender
Kassahun	Vice-president for administration (University)	Male
Haymanot	Gender Officer (University)	Female
Mesfin	Higher Education Coordinator,	Male

	MoE	

All names used in the analysis are pseudonyms assigned by the researcher to ensure the anonymity of the participants.

Theme One: Gender Relations and Stereotypes

Gender Relations

Gender relations in the context of this study was defined as the participants' experiences specific to their being female. For example, one student said,

> In campus, most students start relationships; in this relationship most boys manage their time much better than females do. They work as hard as they can, may spend the day working in the library until late in the evening. When they get tired or when they need to rest, they call to their girl friend who might have planned to study at that time. They use us as a refreshment. Even if we were reading, we would stop it and go out with him. (Rediet, SP)

Otherwise, due to the way they live in their residences, the girl-to-girl bond was stronger than that of boy-to-girl. Students spend most of their time with their same-sex, same-major friends. Only two of the student participants discussed about having more male friends, and hanging out with male friends in their spare time. However, none of the students talked about having or not having boyfriends. One reason for this may be the Ethiopian culture, which does not appreciate publicly talking about such relationships. Nevertheless, some participants talked about the experiences of other girls with their boyfriends and to some extent their dating experiences. From their facial expression and the tones of their words, it seemed that none of them favored having a boyfriend in college. They mentioned having boyfriends as a bad behavior.

The residential proctors who were interviewed expressed the situation similarly. They all said there were some students who have "bad behaviors" of dating boys, going out with them and "likely having unprotected sexual experiences" which endangers their life and leads other students to what they are practicing (Almaz, RP). In an effort to strengthen the students' life skills and create awareness about sex and reproductive health, the gender officer said the gender office prepared different training programs, but it was a big struggle to attract the students to attend them. She said,

> When [the students] first come to this college, we believe that they, especially girls, need some life skill trainings to help them smoothly transition to college. However, we do not have budget to do so; the university doesn't consider the gender office seriously and it is always a fight to have big budget decisions. Other non-governmental donors have different interests so they do not fund us for such plans. (Haymanot, UR)

She added that although her office believes that one of the needs of the students is to stay safe and healthy on campus and they tried to create awareness of reproductive health, sex education[3] and HIV/AIDS, they face big challenges on making the students attend the trainings and awareness sessions. At the same time, they witnessed students having problems related to unsafe sex and relationship violence. She said, "I think it is related to our culture, we are not raised freely talking about their dating life and other sexual issues, not even with our family. It is not our norm to publicly discuss sexual and reproductive issues, so I don't blame the students for not having the interest or the courage to participate in such programs" (Haymanot, UR).

The resident proctors also shared the idea of the gender officer that the students lack the necessary life skill to deal with the social challenges of college. They said that the students do

[3] There is no sex education at any level in the formal Ethiopian K-16 education curriculum.

not know how to protect themselves from peer influence. One of the proctors said, “Most of the students are very fresh in many social respects and are not ready to take over the negative influences of a few behaviorally ruined girls” (Sisay, RP).

Stereotypes

Most of the students discussed how men and women perform in their fields and revealed some sort of stereotype. The stereotypes against female students were in every combination; female students against each other, male students against female students, and faculty and staff against female students. They explained that stereotypes made women less competitive with men and perform less well in their fields. The few outstanding women were considered exceptional. The data from the university’s office of registrar also showed that men outperform women in almost all of the disciplines (see Figure 4.2 below).

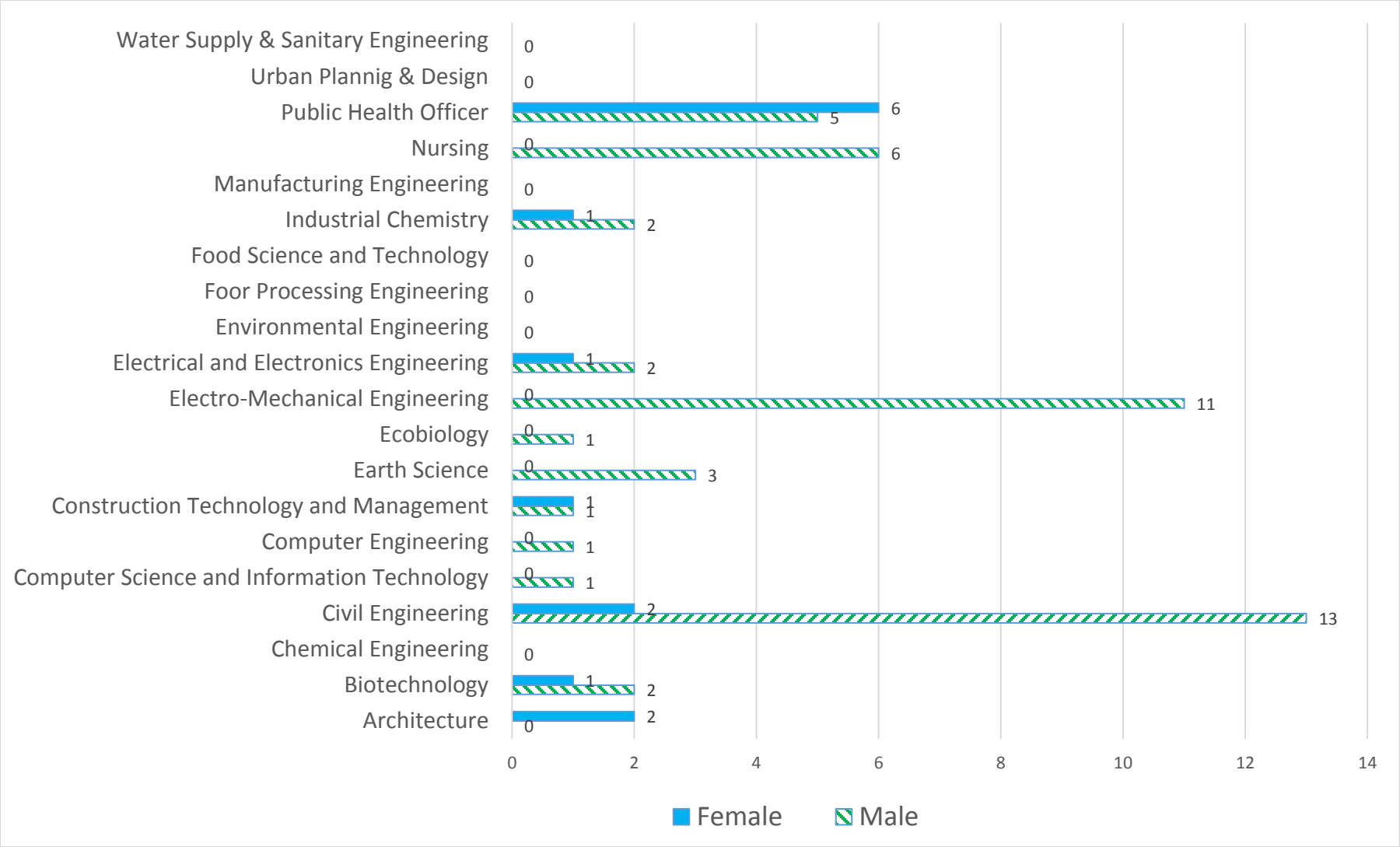


Figure 2. Number of students Who Scored 3.5 and Higher GPA in 2011/12 Academic Year (Data from university registrar documents)

The figure shows that in almost all the departments, there are more men than women with a 3.5 or higher GPA. In general, out of the 62 students who scored a GPA of 3.5 or higher, women constitute only 14 (22.6%).

A student named Rediet also talked about the stereotypical marginalization of women in certain engineering fields such as electrical, manufacturing, and mechanical engineering. She said this is a problem that potentially affects women from choosing and joining the major they like most. She said that most girls ask the question "Which field is good for women?" And if they are assigned in a major that they considered as masculine, it takes them a while or forever to feel a sense of belonging, which in turn affects their academic performance. Similarly, another student raised the problem of a stereotype that "…men are always better than women in science and engineering." She said that due to this stereotype, girls who can perform very well "… convince ourselves that we cannot do as good as boys or even better than boys" (Rediet, SP). She also added that it is one big problem affecting girls' academic performance, which needs to be alleviated in some way.

When one student expressed her comparison of boys and girls with respect to their academic achievement, she said,

> There are female students who can perform better, but sometimes we convince ourselves that we can't perform as good as boys or even better than boys. Even when we get greater grades, we don't believe that we are better than them. (Rahel, SP)

The same was said by another participant, Kalkidan, who was very confident and is scoring very good grades in her highly male-dominated major, with only 14% female composition.

She said, “most of the girls complain and get bored thinking that it is not a woman’s task, you know it is muscular.” This participant had strong beliefs that this all was stereotype so she continued,

> … I always advise my friends that nobody gave these tasks for men; it is all what the society created and our mind believes. We can do it, we have the capacity; [the women in my class] think that bending and molding steel is so difficult and manly, so some of them let the boys do this part for them. But I personally prefer doing it myself with all my body sweating, and the boys believed in me that I am good not only at the paper-pencil tasks but also at the hands-on activities. (Kalkidan, SP)

One participant in Electrical and Electronics Engineering major shared the ideas previously raised. She said,

> I personally feel angry by the common stereotypes on women in male dominated fields like electrical engineering. Even when we first came, everything talked about such fields as electrical and electromechanical engineering is masculine, and these are men’s fields. If there were not many females in these fields in the past years, does it mean that women should not be in these fields now as well? I don’t think so. I mean we have to change this trend. As an institution, the university should work on that. Some first year females come and ask ‘which field is women’s field?’ because they don’t want to go to those fields categorized as males’. (Seble, SP)

Another student discussed this masculine-feminine description of engineering majors the same way as the common stereotype that more “masculine” fields are only for men. Explaining that there are more females in her department than other departments, she said, “… I think our department is good for women, because there is no hard labor work, which needs masculinity. …

I heard some friends of mine complaining about carrying heavy weight, cutting and welding heavy metals, and other difficult stuff" (Menbere, SP).

These stereotypically biased beliefs of women in male-dominated fields can affect their interactions with each other and with the men in their field. In this regard, one of the student participants said,

> … you can't see a girl helping a boy in academic work, like assignments. Even I have noticed that when a girl needs help, she would prefer to ask a low performing boy to asking a better performing girl; only because there is a belief that boys know the subject matter better than girls. (Rahel, SP)

This belief is that even if the task doesn't require any physical labor or masculinity, men are still thought to perform it better. One participant in the Manufacturing Engineering major expressed this common stereotype in a different way. She said, "… our field is kind of mechanical, females usually don't intend to choose this major and surprisingly, all our professors were males until one female professor joined the department this year" (Kalkidan, SP). The lack of role models from faculty or industry is one factor to internalize the stereotype that such majors are not for women. Therefore, women continue to be minorities in these fields. In addition to the stereotypes, three student participants, Markan, Rawda, and Rediet, raised the same point that lack of mentors and role models was a big factor that affected their academic commitment and self-esteem in their major. They said that they would have felt better and much at ease in their major if they had successful females in their field to show them how to tackle problems of being a female in their male-dominated engineering and science fields.

Expectation. Usually the boys have lower expectations for the girls until they see that the girls can perform as well as they do. One student who was among the good performers in her

class said, "…before [the boys] see our performance, I mean our grades, their expectation for us is very low. For example, last year we all were new and nobody knows about anybody, so the boys did not want to give us a chance to participate as much as they do; only because they didn't expect us to be as much competent" (Seble, SP). However, this student added that these low expectations last until the girls prove that they can work as good by getting higher grades; they will then be over burdened by being expected to do all the work. She said "in my dorm all the three of us have a very good GPA, so the boys in our group expect us to do most of the tasks; both in lab work and in paper assignments" (Seble, SP).

Less is expected of female students from male students and course instructors. For example, one student talked about how course instructors group them in a way that every group should at least have one female member and she said, "the reason some professors do such grouping is, I think, that they do believe that the girls need some help from the boys to do the task. I can tell that some professors have low expectation for us because they will be surprised when a girl scores higher grades in their course" (Markan, SP). The problem of lower expectations for women is not only from males. In some cases, the women have lower expectations for themselves. For example, one participant says, "there are girls who really perform like boys, or even better than them" (Rawda, SP). The comparison "like boys" has a sense of boys are expected to perform well, while girls who perform well are "like boys," not like girls are supposed to be.

Theme Two: Students' Self-Perception and Commitment to Major

For this specific theme, the participants' self-perceptions are explained when they describe their academic ability in past and present terms. Their commitment to major is

explained through two concepts – the degree to which they wish they could switch to a different major, and/or whether or not they are assigned to a major of their choice.

Academic Self-Perception

During the interview, most of the student participants explained how they considered their academic ability, their desires to survive in their major, and their intent to switch to a different major if they were given the chance. As was discussed in earlier chapters, students who pass the college entrance national exam are assigned to one of the public universities in the country. The MoE assigns students to a university and a discipline based on the admission capacity of universities and the students' five prioritized choices (e.g. engineering, health sciences, social science and humanities, etc.). Although there is no guarantee that they will be assigned to a major of their choice, those who have higher grades have greater probability to get their first or second choice. After they are placed in a discipline, they will then make another choice to a specific major (e.g., those placed in engineering make a choice to major in civil, or electrical engineering, and so on).

Among the 15 students who participated in this research, only four were placed in a major of their first choice. The rest were placed in their second, third, and even fourth choices of major. One interesting finding is that those who are placed in their chosen major were more successful academically than those who were placed outside of their interest. For example, one student participant who has got a major of her choice explained, "… I am so glad that I am scoring very good grades in my major. Electrical engineering was my first choice and I really love being in here; I wouldn't be any happier in another major" (Seble, SP). In the same way, one of the four students who are in their chosen majors said, "… I have a cumulative GPA of 3.58" (as it is seen in Figure 2, it is very unlikely to achieve such a grade for most students). She

added, "… even though I did not have any idea what Mechanical Engineering meant before I got in, I like it very much now and would have regretted had I chosen another major" (Kalkidan, SP).

If a student was not placed in a major of her first or second choice, she wished to be placed in a major that was related to those choices. For example, one participant who had a childhood dream of being a medical doctor chose Medicine as her first choice. However, "Unfortunately, or fortunately," ended up in the Public Health major, which was actually her second choice. She said, "I don't really complain, because it is at least health related; I have friends who chose medicine and who were placed in engineering and agricultural sciences" (Meseret, SP). Similarly, students who were placed in the engineering discipline by their choice were happy, even if they did not get the specific engineering field they chose.

The third case was students who were placed in a totally unrelated discipline from what they chose to be (e.g. those who chose health sciences but were placed in engineering), but once they made choices in that discipline, got a specific major they chose (e.g. after they were placed in engineering without their choice, they chose civil engineering and got their choice). For such students, the interviews showed that they began to like their current major. For example, one student who chose to be in Public Health but placed in applied sciences and got computer science by her choice said, "I am glad that at least I got what I chose this time; I always learn new things about computers, and most of all I know that it will not be hard to find a job after I graduate" (Martha, SP).

One important point to raise here is the reasons the students chose their discipline and/or their major. Some students said they chose a specific major because they know someone successful in that field (e.g. Markan, SP); some said they chose a major because that is what their

parents wanted them to be (e.g. Rediet, SP; Seble, SP), and one participant said that an older sibling forced them to pursue that particular professional path (eg. Rawda, SP). The most common reason to choose a certain major is finding a job after graduation. For example, a student in the civil engineering major said, "I am from a low income family and can't afford not having a job after graduation. That is why I chose civil engineering; as you know there is a high demand of civil engineers in our country. So, I don't at least worry about finding job after graduation" (Rediet, SP). Two other students who chose but "was not lucky" to be in the medical fields explained that one of their reasons was that there is high job security in the medical fields, and there is no worry of finding job since the Ministry of Health does the job placement right after graduation.

Getting back to students making choices and how their placement affects their self-perception, participants who were placed in a major that they did not choose said that they have lower grade point averages and wish to switch to a different major. One student who wanted to be in the medical field, but was placed in engineering, expressed her self-perception as, "I have never been an outstanding student and still perform below average in my department" (Rediet, SP). One of the student participants said she was assigned to her third choice of major and her facial expression and body language indicated she was lacking confidence. When she was asked to describe herself, she confessed, "I am not a good student academically, I am only struggling just to survive" (Eyerus, SP). Struggling to survive is a common battle that many Ethiopian college students deal with because of the overwhelming expectation of family and the overall society on children's education, especially on those who made it to college. It is a very big deal to go to college and a college student is overtly expected to succeed, to complete his/her degree no matter what. And not being able to complete your degree is considered as a big loss and a big

shame for you and your family. From my own experience as a college undergraduate and that of my siblings and close friends, we were much more worried for the feelings of our parents and for what our community would say if we fail from college than what will happen to our future. I witnessed several college students who committed suicide because they got dismissed. One student pointed it as "it is a life issue" (Meseret, SP) to succeed in college, which seems to be a big pressure on her shoulders.

One participant discussed her perception of other female students. She said, "in our department, most of the students who perform best are males; females mostly score lower grades as compared to males and I think it is true in many other departments" (Rediet, SP). All participants connected their placement in their major and current academic performance to their academic performance in high school and their high school graduation exam result. They know that the higher their result was, the more likely they got the major they chose. One student who was placed in her second choice shows this:

> I first chose to be in Public Health Science department, but the competition was very strong. This department demanded higher grade than I had and there were many students who chose this major and had higher grades. So, I fail to get my first choice. (Martha, SP)

One student even talked about how she made her choice of majors; she said,

> I wanted to study a health related field but I didn't choose medicine because I knew my grade was not high enough to compete with other students who might have chosen medicine. … I made engineering my third choice and I was sure that I would at least get engineering because I knew engineering is almost for everyone. (Menbere, SP)

Students also expressed that their academic self-perception was a factor for the amount of effort they exert to succeed. For example, the student who got the major of her choice and who

said she has a GPA of 3.58 said, "… in my freshman year, I said to myself that I have to work hard, whatever it costs" (Kalkidan, SP). This student set a higher expectation and had a positive perception for herself that she believed that working hard pays back.

Commitment to Major

Their commitment to their major depended on two main issues, as shown in the interviews; one is whether or not they are placed in a major of their choice, and the other is whether or not they believe that there is high demand of that field in the job market. The interviews showed that there are some students who are committed to their majors, like their major, and have no intention to switch to a different one. The four students who were assigned in a major of their choice showed the highest commitment to persist in their majors. When they explained how they felt about their major, they used strong words like, "There is no better major for me" (Seble, SP), "I would have regretted had I chosen another major" (Kalkidan, SP), and "I was so lucky to be assigned in the department I chose … I work hard and I am scoring very good grades" (Bezawit, SP).

Some students did not like their major at first but they began to like their majors over time. For example, one student who was assigned in her second choice, when she asked how she liked her major once she was assigned, replied, "I am kind of liking it now, I always learn new things that I don't know about computers. It somehow entertains me, so I like it" (Martha, SP).

On the other hand, there are also some students who would not hesitate to switch to a different major even at a cost of going two years back from being a junior in their major to being a freshman in a major they chose. One of the student participants said that she would rather go back to high school and give it a second try to get her choice than getting a degree in her current major. She said that she is struggling only to survive because she does not have any other option

(Eyerus, SP). When one participant discussed the experience of two of her dorm mates who were assigned to their major without their consent, she said:

> … they still wish to go to a different department. …since they didn't like the department, they don't study hard; they tried at first but now they give up. They say they don't have any interest in the department so they only study not to get dismissed, they don't think about scoring higher grades or so. (Rawda, SP)

Their prior knowledge about their major is also one factor determining their commitment to the major. As discussed above in the academic self-perception section, students do not choose their major with the relevant know how of what that major is, or what to do with a degree in that major. Some are externally influenced and others know about it from word of mouth. There was even one participant who chose her major by her religious belief; before she chose one major she said, "oh Lord, you know what is best for me" (Kalkidan, SP), and just picked one from the list. This student is actually very committed to her major now because she is so faithful that this is the major God led her to. One other participant who was assigned in the Manufacturing Engineering major that she did not know about said,

> I now see how difficult it is in this major. It was not my choice because it is very new and I knew nothing about it. I never heard of it like I did for other engineering majors like civil, electrical or mechanical. So I had no idea what it is and what I am going to do with it. (Rahel, SP)

The university gives a general orientation about each major before the students choose, but it is very general and "not well explained, and not clear" (Bezawit, SP). Even after the students know a little about their major once they are in, they might feel better about it but it is not still easy to develop strong commitment. One student said, "I feel better now, but if I would

be given another chance, I tell you frankly, I would not hesitate to switch to a different major" (Rahel, SP).

Theme Three: Students' Relationships with Others

I asked all the student participants, "How do you describe your relationship with your peers and with your professors?" Their responses comprise the third theme to emerge in this research: students' relationships with others. This theme is divided into two parts. The first is the students' interactions with each other, and the second is their interactions with faculty and the rest of the university community. In the first sub-section, I identified two elements: how they interact in academic environments and their interaction in social environments. This theme also illustrates some of the social and academic challenges the students had in the campus environment. As in other themes, all the experiences of women in male dominated fields will be explained as their unique experience using their own words according to Third World feminist theory.

Peer Interaction

As a cultural insider born and raised in Ethiopia, I witness how Ethiopian culture appreciates and values social interaction to a great extent. Ethiopian people in one community are always there one for another; they mourn together and cheer together. Their lives are strongly tied to one another. Young people who came from communities of this kind to a different university environment where they do not know each other need to form their own temporary community for as long as they are there. They need to support each other and feel that they belong to that community. One student explained that the way one perceives her/his campus experience depends on how she/he interacts with others. She said her campus experience is:

> … [G]ood so far. It may be because, you know, it all depends on who you have around. The people I got to know here are very nice and kind. If you are comfortable in your environment, then it will be much easier to transition to campus. (Seble, SP)

There is no group or event that makes the students feel at ease, except they get used to it through time and with the help of some close friends. The university delivers a half-day welcome and orientation session for freshman (first year) students. The orientation focuses on "University life, academic rules, rights and duties of students, disciplinary issues, gender, etc." (Student Handbook, 2011). Hence, this is the only firsthand information the students get about the university and life there.

There is no other form of social or emotional support system within the university that helps the students easily transition to college. What they have to do is only create their own community and exercise positive peer interaction. One student said, "Whenever you face any personal and academic challenge, there is no one to give you advice; we actually have proctors but they are not counselors. Even if they want, they don't know how to counsel us on our problems" (Rawda, SP). Socialization was harder for some students than others. Some got used to the environment quickly, while others needed more time to make friends and associate with the environment. For example, one student who was a sophomore said, "I still don't have close friends so I don't want to stay in my dorm for so long. Any time I am in my dorm, I sit on my bed covered with a tension box[4] and do not talk to my roommates too much" (Menbere, SP). This student keeps herself isolated from the rest of the campus community where the main support system is based on one another. The gender officer said that they used to have a counseling office to assist them on anything they needed, including their anxieties and stresses in

[4] This means covering her bed on the sides with a piece of cloth like a curtain so that she sees nobody and nobody sees her.

their social, personal, and/or academic life in college. However, at the time this study was conducted, the counseling office was closed. The gender officer said, "… the guidance and counseling office was active for some time and students were benefiting from it in various ways, but since the expert resigned a new one is not hired" (Haymanot, UR). This, according to her, is a challenge for the student community that needs the university's attention.

Students interact with one another in different ways. They interact in classroom settings, in laboratory workshops, in their residences, and other curricular and non-curricular activities in the campus environments. Student interactions in these settings are discussed in the upcoming sections.

Students' interactions in academic settings. The academic setting in the university, like many other STEM environments, is male-dominated. As an example, the data found from the university's registrar is presented in Figure 4. It shows the number of students assigned in the university by the MoE for 2013/2014 academic year. As shown in the figure, women's enrollment was only 28.9 % in engineering, 40% in computer science, 28% in medicine, 24% in public health science, 36% in nursing, and exceptionally, 55% in natural and computational sciences like biology, chemistry, and statistics.

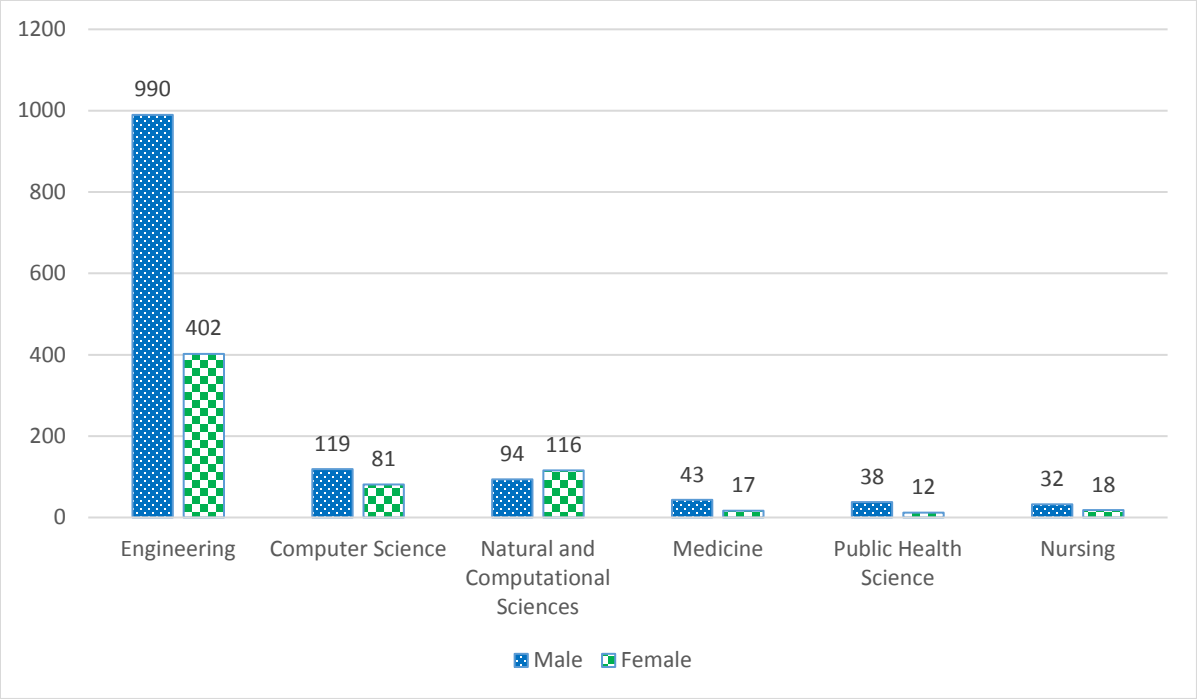


Figure 3. Students Assigned in the University by MoE for 2013/14 Academic Year (Data from university registrar documents)

Data from the university's registrar office also showed that out of the total 1962 students assigned in the university in 2013/14 academic year, women were only 646 (32.9%). However, this percentage composition decreases as the years elapse because of the higher attrition rate of women than men. Figure 5 shows the percentage composition of men and women admitted and their attrition rate for the 2013/14 academic year.

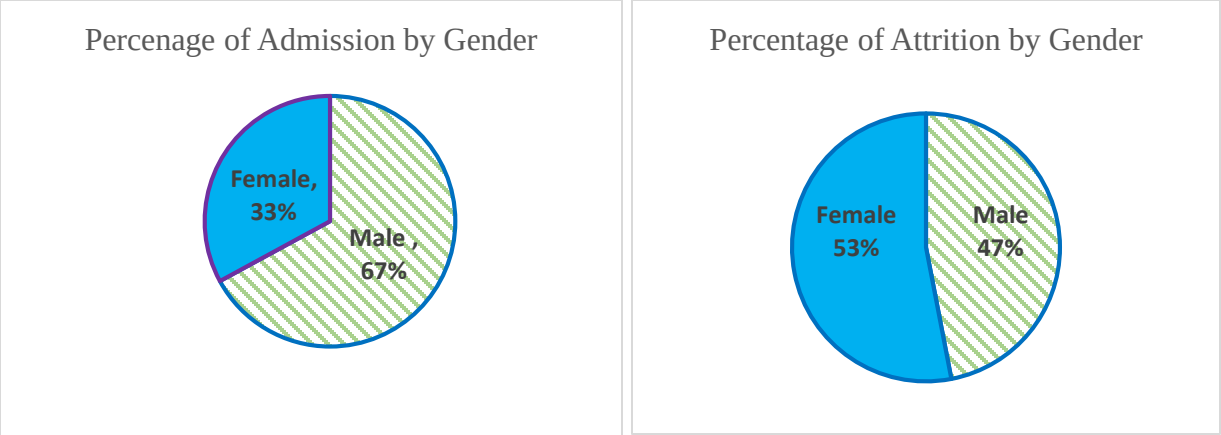


Figure 4. Percentage of Admission and Attrition of Males and Females for 2013/14 Academic Year (*Data from university registrar documents)*

Similarly, for all the degrees the participants were pursuing, the composition of women in each classroom was very low. Many departments had between 15% and 30% female enrollment, except two extreme cases. One positive extreme is Environmental Engineering, where 42% of sophomores were females. On the other hand, only 7% of juniors in the Electromechanical Engineering major were women. For most participants in this study, the women prefer to be grouped with other females than grouped with males. For example, one participant said, "I feel more comfortable working with my female classmates, more specifically with my dorm mates. Whenever it is possible to form our groups, my roommates and I will be together and add a few boys with us" (Seble, SP). This is common for most of the students. Another student also said,

> We are only four girls in my class of 31 students. The four of us usually sit in a row in our classes… the only way we get close to the boys is when we are grouped to work with them in a group assignment. (Rahel, SP)

This is true even if the women are almost equally represented in a class. For example, it is evident from the description of the participants that women are 42% of sophomores in the

Environmental Engineering major. However, they still prefer to work with each other than with the men. One participant, a sophomore in Environmental Engineering major, said,

> … [A]ll girls sit close to each other on one side of the classroom and the boys altogether on the other side. This I think can potentially affect our interaction because you would most frequently interact with someone sitting next to you. Girls usually work with other girls, and boys with boys; there are actually some few exceptions in both cases. (Menbere, SP)

This makes it possible to suggest that the living environment being gender differentiated has an effect on how boys and girls interact in the academic setting. The girls and the boys have very limited connection, even in a classroom setting while the girls spend most of their time together. Supporting this idea, one participant said,

> …we are not very close to the boys. We meet with them only when we are in the same group for an assignment or a project. Otherwise, we do most of our work around our dormitories with our female friends. (Bethel, SP)

Students' interaction in social settings. To have some sense of their social experience, all students were asked, "How do you spend your spare time?" This dialogue provided information about certain social interactions among students. For example, most participants went for a walk with friends at the end of the day, a common practice in Ethiopia. Several issues were discussed while walking; it is an ideal time to have fun and get away from the academic stress for some time. At times, having a walk together is more than just a friendly hang out; serious social problems might be discussed, and friends brainstorm about their opinions on different matters, and students in a relationship enjoy having some personal time together while walking.

Having a tea, coffee, or a soft drink together is also another common practice among the students. As there is a dearth of recreation centers in or near campus, the students have only a few options to relax. There are two lounges on campus, which serve only food, soft drinks, and hot drinks like coffee and tea.

One other way they interact socially is in their residential buildings. One student emphasized the strength of their interaction by saying,

> [A]s the girls are very few in number in my department, we have only three dorms of women, each dorm having 4 students. So, not only in our classes but also our personal life is very interdependent. The good thing this time is that we all are assigned dormitories with our classmates, so my classmates live either in my dorm or next door. This makes our lives to be strongly tied to one another. (Martha, SP)

Interaction with Faculty and the University Community

Most of the student participants described their relationship with their professors as "good" or "not bad." The most common indicator of the kind of interaction they have with professors is that the professors helped them well in class. For example, one of the participants who said students in her class have a "good relationship" with their professors said, "Most of [our professors] do not actually get close to us, I mean they are not friendly, but they help us well in the class" (Seble, SP). A similar response was heard from another participant in another department, Kalkidan:

> Question: How do you describe your relationship with your professors?
>
> Kalkidan: It is not too bad.
>
> Question: What do you mean by that?

> Kalkidan: I mean they are not very friendly to approach, but we can at least ask questions freely in the class.

In another related question, this student, who first said that students' relationship with professors is "not too bad," explained it more deeply. She said,

> [W]e see them only in class; it would have been better if they set office hours and welcome us in their offices for discussion. What they do now is they set time only to show us our exam results; even in these cases, they will say something like 'only today or tomorrow, no other days.' We even do not know the offices for some of our professors. (Kalkidan, SP)

To express whether or not their relationship with professors is good or not, the students commonly talk how the professor teaches them in class. For example, one participant who first said that their relationship with the faculty is "not bad" said,

> …[T]hey are good only at teaching us the academics. Otherwise, they do not want to listen to us if we have something to talk about. No room for anything outside of the academics. You even have to be good academically to be more close to them. (Eyerus, SP)

One important point this student raised is that students who perform better academically have a better chance to get closer to their professors. From the sentiment among the participants, it is not clearly indicated whether their closeness to the faculty made them perform better or their better performance made them closer to the faculty. This student who identified herself as "struggling to survive" in her major, when she talked about her own experience with the faculty said,

> I personally do not have a nice relationship with my professors. I just attend their class, take notes, listen to what they say, and that is all. I do not even ask questions because I learned from what happened to other students, how they were mistreated for the kind of question they asked. (Eyerus, SP)

Another student elaborated on the connection between academic performance and the relationship with faculty. This student who first said that the students' relationship with faculty was "not so good" later explained that almost all of their professors are males and she personally thought:

> … that our relationship is solely dependent on how we perform academically. [The professors] sometimes do not listen to what we say; or sometimes they will ask us a question and we will be taken wrong from what we answered. Some may even ask a question but will not listen to what a student replied. All in all, student-faculty relationship depends on who the student is. (Bethel, SP)

Another participant from a different major expressed the same idea. She said, "Students who are high achievers in the department are more close to our professors than the rest of the class. I think it is natural that professor like good performers more and they are very close to them" (Rawda, SP).

For the same question, "How do you describe your relationship with faculty?" one participant explained it in a very short and clear statement; her explanation was different from other participants. She said, "There is no relationship; they teach us, we learn" (Efrata, SP). This student, unlike other participants, believes that the professors teaching and the students learning is a natural process, there was no relationship between them unless there was something more

than simply teaching and learning. When she was asked to elaborate it more, this participant said:

> I never heard anybody talking to a professor about personal issues, I never did so either. For some of them, we don't even know their offices so that we could go and talk to them personally; they never had office hours. In some classes there are only a few students who might ask academic questions and get academic answers, but it is not still common. (Efrata, SP)

This student considers a relationship between faculty and students to be something out of class, or something social as well as academic, perhaps because the academic is the default. One other participant also had a similar response for this question. She said:

> [T]here is no different interaction between students and professors than just teaching and learning. They are willing to answer students' questions related to the subject matter taught in class, but I do not remember any student meeting a professor out of class or for any personal issue. (Menbere, SP)

Some students wished for the opportunity to freely talk to their professors about academic and non-academic issues. One student said:

> I wish we had a chance to talk to our professors about our personal issues. They are the only professionals we meet in campus; we don't have mentors, nor do we have social or academic counselors. There should be some other way that we can talk to them than simply seeing them and listening to what they say in class. (Rediet, SP)

Another common factor commonly raised by most participants was the age of the professors. The younger the professors are, the easier it is for the students to get close to them. They use the word "afraid" as equivalent to "not so close." For example, one participant said:

> We have a good relationship with our professors; at least we are not afraid of them. They are young and easy going. We ask them questions freely and they answer. We may not get them out of class but we are close to them in class. (Rahel, SP)

This means that they did not feel comfortable asking questions if the professor was an older person. The students also had a different approach for the professors based on how young or old they were. Supporting this, one participant said, "our professors are not so hard to get connected to; I mean, they are all very young" (Rediet, SP). Another student told a similar story; she said:

> There are some good professors and some bad ones. But for the majority, as far as you get close to them and ask for help, I think they are there to help. We are not afraid of them because they are young. (Bezawit, SP)

Something taken for granted in American university classrooms is that course syllabi have email addresses, phone numbers, office location and usually office hours. Based on this information, students are able to freely communicate with course professors and teaching assistants. However, it is a luxury to be able to call a professor for the study participants. When expressing how good some professors are, one participant said, "There are even some professors who are willing to have phone calls from a class representative" (Bezawit, SP).

An additional common issue is that most university faculty were male. In all the departments where the student participants were enrolled, there was one or no female faculty members in the entire department. As the participants were all females, the absence of female professors might have an effect on their interaction with faculty. This also leads to strengthening the stereotypical beliefs regarding women in STEM (Richman et al., 2011; Tsui, 2010). For example, one participant who was a junior in manufacturing engineering, who earned good grades in her field, said, "As [this major] is kind of mechanical, females usually do not intend to

choose it. Surprisingly, all our professors were males until one female professor joined the department this year" (Kalkidan, SP).

The university considers affirmative action to hire more female faculty members but there are some challenges on the administration's side to hire the best fit candidate for a faculty position. On his discussion about problems related to hiring, retaining, and controlling faculty, the university's vice president said:

> The university is located very far away from the center of the city. There is no convenient means of transportation, there is a communication problem in-campus as telephone and internet services are frequently disconnected due to construction undergoing in the compound, the faculty doesn't have suitable offices to stay at as we are still in the process of building the university. (Kassahun, UR)

This is one big problem for the university to attract well-qualified and competitive faculty members which, as he said, "…affects the quality of our faculty which in turn has an effect on the quality of education we provide our students with" (Kassahun, UR). He also discussed that it was difficult to focus on professional development and evaluating faculty for tenure because "even if we hire some faculty members, there is no guarantee that they will stay with us until the end of the year, or even a semester" (Kassahun, UR). This makes their faculty hiring job very routine and makes them "keep very irresponsible and lazy faculty only in fear of not finding a substitute in the middle of the year or the semester" (Kassahun, UR).

Theme Four: College Experience

For most college students in their first year, university life is their first experience to live away from family. As a result, some of them may experience loneliness and find peer-group interaction very challenging and intolerable. They all expected that college life would be

"challenging"; some found it less challenging than they expected, and some said it was more challenging than they expected. Some were adjusting over the years, while others said that college life was becoming tougher over the years. In this theme, three patterns will be discussed based on the participants' responses. These are: (1) overall campus environment, (2) the participants' experiences in classroom settings, and (3) the participants' experiences in residence buildings. In the first section, the college environment, conveniences, and resources will be discussed. The participants' classroom experiences will be discussed based on their group interactions, their work shares, and assessments. Finally, I will discuss the participants' residential experiences, especially residential culture, and most importantly, academic integration and social integration in residential buildings will be discussed in greater detail.

Campus Environment

The university investigated in this study is one of the recently established public universities in Ethiopia. Due to the overwhelming increase of the government's student intake ambitions, the university started admitting students before it was ready to accommodate their basic needs and before it made basic facilities available for the university's administration, faculty, and staff. It admitted these first students on a different campus that belonged to another public college that is geographically located far from the current campus (Kassahun, UR). The students stayed there for a semester until classroom and residential buildings were ready to serve them. They expressed that their first experience was "terrible." For example, one student participant said:

> We stayed there for one semester and it was horrible. Eight students live in one small room which was very crowded and suffocated … For your surprise, five more students, who were first denied dormitories because they were from Addis Ababa (the city where

the college is found), were added to our dorm and we became 13 in one room. (Kalkidan, SP)

Inconveniences. In the summer 2014, when data were collected, the university was in its third year of service. However, there was still so much construction undergoing on campus, there were loud noises everywhere created by large construction trucks and bulldozers. Some students talked about the loud noises the construction created and the inconvenience of walking on campus as the road was dusty during summer and muddy in the rainy season. I witnessed this problem myself during my stay in the university: I sometimes worried how to walk the long muddy or dusty road from the university's main gate to the offices for about 20 minutes. All these made it inconvenient for the students and the campus community to walk around on campus.

Another inconvenience in the campus environment mentioned by several participants is the lack of recreational places for the students to spend their spare time. For example, one student, when she talked about how she spends her spare time, said, "… sometimes we go off campus because we don't have cool places here in campus or near campus. So, when we really want to go out, we need to go a little far away from campus, at least Kality[5]" (Martha, SP). Many of the participants spent the majority of their spare time taking naps in their rooms and/or going home if they were from Addis Ababa. Their common reason was because there was nothing else to do on campus; they said there were no recreation centers or fun things to do in or near campus. Sometimes they may get a free Wi-Fi internet connection, which is something to spend their spare time with, but it is very rare and with very weak signals. For most of them, internet connections were very luxurious and were celebrated when acquired. During my few weeks' stay

[5] A place which takes half an hour to an hour of taxi ride from campus based on the availability of transportation.

in the university, I never had a chance to get connected to the internet while on campus. One day, we were told that there would be Internet and everyone was super delighted. However, it did not work as expected and everyone got disappointed.

The residential proctors also talked about the problem of poor facilities and how it affected their work, as well as the lives of the students. One particular proctor said,

"I am so sorry for the students here. I worked in another university before I came here and always compare my former experience to this new one" (Beza, RP). She also mentioned that sometimes, having a chance to watch TV is like a luxury. All the proctors, including the head of the proctors, also discussed repeatedly about the lack of recreational places on campus. One of the proctors said,

> The worst problem, in my opinion, is that the university does not consider our questions and the students' needs to have a healthy place to spend their spare time on campus, to take a break between classes, or to refresh their mind in some long days. This made us so worried because the students sometimes go off campus just to have fun and they put their lives in danger. The services they get off-campus are not student friendly, the kids are very young and have no exposure to such things before they came here, so as a responsible body to assure the health and wellbeing of the students, I feel guilty for being of no help. (Hagere, RP)

The proctors all agreed that the lack of recreational spaces on campus drives the students to easily get influenced by "girls with bad behaviors." One proctor said:

> They first start going off campus for the sake of having a cup of coffee, then they start taking a glass of wine, or a bottle of beer just to know the taste. Finally, they become

addicted and become drunkards, and smokers. To the worst, they may become drug addicts. (Almaz, RP)

From what the proctors said, they blamed such campus inconveniences as the root causes for what they call their biggest worry: "behavioral problems." The reason, they said, was because if the students had several options to spend their time on campus in a healthier way, they would not even try to go out and learn those "bad" habits.

Resources. The university studied in this research was one of the recently established public universities in Ethiopia. Despite the increased admission rate of public universities, this university does not have a problem related to accommodating students with residences. The university built a great number of residential buildings, and is still constructing many more for the growing number of future students. Unlike other public universities, where 12 or more students could live in a single dorm, there were only four students in one dorm, which makes the students more privileged in this regard. Another privilege of students in this university is that all admitted students in the university were eligible to get dormitories, regardless of where they are from. This is not true in other universities, which deny dormitories for students whose families reside in the city where the universities are found. This was one quality that the students were thankful for. When they were asked about their residences, the first thing most of them said was "we are only four in one dorm." As I toured in the women's buildings and dormitories, I observed that every room has a table and four chairs, which was not common in most other public universities.

On the other hand, all participants, including women's residence building proctors and the university's vice president, talked about the challenges they faced regarding infrastructure and utility facilities. These include, insufficient water supply, power outage, limited or no

telephone and internet network, and so on. One reason for all this was the ongoing construction on the campus. Sharing her thoughts, one of the proctors said:

> that there were times where one of the vice presidents carried barrels of water on his car from his house for students' residences on a daily basis just to help the students cope with the problem. However, it never was enough for more than their basic needs. Taking bath might be considered a luxury, sometimes. (Almaz, RP)

A student said, "There are times that we need to go home just to take shower, this is so annoying" (Hanan, SP). Another student expressed it in a similar way "… some of the things that I am not comfortable about our campus is that we do not have sufficient water supply. Water is a basic need and not having water means a lot" (Meseret, SP). The fact that the university is out of town makes it even harder for the students to go somewhere else to solve such problems.

The students also complained about the electric power outage, especially during exam weeks, which limits the possibility to study after it is dark. One student said, "… plus, we might not have electric supply for days. Not having electricity during final weeks means there is no library and we should study in our rooms with candle light; this is horrible" (Meseret, SP). Power outages are one of the basic problems with the administration and the staff as well. I witnessed the problem during my stay at the campus for data collection. There was no remedy to solve the problem except waiting until the power came again because there were no generators to cover the power loss.

Another resource related problem that some students complained about was the library facilities in the university. For example, one student participant said:

> [I]n my opinion, I don't believe that we have libraries. There are no books; if we have one or a couple of important books, we need to wait for a long waiting list for our turn to

> use it for only an hour. There are no computers for us to work on our assignments, or no internet connection to access online resources. (Markan, SP)

Overall, the university was not fully established yet; there were several basic needs of the students and the entire university community that need to be addressed to make the university a fully functional institution. However, the university had aspirations that it will be in a much better shape in the near future with the completion of the buildings under construction. Its plan to expand its programs to Master's and Doctoral programs, and also expand its undergraduate programs was one sign that it will achieve its goals. One more advantage for the university is its geographic location being at the center of the major industrial zone in the country, which could potentially create a good opportunity for an industry-assisted practical training for the students. This increases the chance of getting apprenticeship and internship opportunities for the students and increases the likelihood of getting mentors from industry for the students.

Classroom Experience

As all the student participants were females, their responses to questions regarding their classroom experiences were analyzed using Third World feminist lenses, as in previous themes, despite the fact that there are both males and females in the classrooms. In the discussion of classroom experiences, other experiences in the academic setting, such as their experiences in lab rooms and lab groups, were included in this sub-theme. More importantly, the discussion focuses on the students' group interactions, and their work share in their academic groups.

Group interaction. All students were asked about how groups are formed for classroom activities, in lab settings, and/or for course projects and assignments. Their responses showed that although they are from different schools, departments, or year levels, they share similar experiences in terms of grouping and other classroom activities. This means that there is a trend

that the university faculty followed or a rule that they are told to follow. Otherwise, each professor should have his/her own ways of handling classroom situations.

Almost all of the participants said that there is a grouping system that is called "one to five (1:5) grouping" practiced by the entire university community; students, faculty, administrative workers, and all other staff. Before discussing the students' responses in this regard, I will first elaborate what this 1:5 grouping means and what it was intended to achieve.

The Popular 1:5 Grouping**.** The 1:5 group organization is one of the recent policies that was developed by the Ethiopian government for the implementation of the first cycle of the country's Growth and Transformation Plan (GTP) of five years, which began in 2010 and ended in 2014. It was developed and organized at the federal level and implemented in all regions of the country and in all public sectors (e.g. education, health, and agriculture). Groups of five people work for common goal by supporting each other. The manual developed by the Ministry of Civil Service (MoCiS) described the objective of the 1:5 grouping as "… for a group and individual success of members, to develop a closer attitude, skill, and knowledge of facts among groups …" (Federal Special Support Board, 2013, p. 6). All groups have one group leader elected by its members. The group leader, in most cases, is the person who has better performance in the task the group is required to do, or the one who is considered to be a role model for others and the most accepted by the group.

The 1:5 grouping system started in early 2011 with a major emphasis on rural areas and in agricultural sectors. It then transferred to urban cities and other sectors, including the education sector. The Ministry of Education (MoE) started implementing this 1:5 grouping system in 2012 for everyone in the sector, including teachers at all levels, students at all levels, and all the staff in academic and administrative positions of education offices, schools, and

higher education institutions. As the current study is based on a public university, which must also implement the 1:5 group organization, all the university's activities, both academic and administrative, practice such grouping.

Accordingly, the students mentioned the 1:5 grouping in their program several times. In most cases, there was a group of five students who are responsible to study together, and to work in collaboration during group assignments and, in some cases, in lab activities. The participants shared their different experiences from participating in such groups. As discussed below, some had positive comments about it, and some had negative ones. In some departments, the students mentioned that the department formed the groups so that they work with the same group in all the courses they took. While in other departments, each course instructor formed the groups, so the students work with different groups for different courses. Some also mentioned that they do not have such groups for some courses because neither the department nor the course instructor enforced the formation of such groups.

The manual prepared by MoE for all public higher education institutions to implement the 1:5 grouping, however, stated that the students were responsible to form their group of five students by themselves, but the group leader should be the student who has the best academic performance. The motive behind the 1:5 grouping, as described in the manual, is "to let students complete their program successfully and to maximize class attendance as the students will have a continuous follow up from each other, and for a better performance through a healthy competition" (MoE, 2013, p. 45).

Regarding the difference in academic performance of each member of a group, one participant said that as it is known who the best (academically) and the worst student is, "It gives more power for some and demoralizes some others" (Rediet, SP). She indicated that the way

they are grouped in most courses challenges their academic performance by advantaging a few students and disadvantaging the rest of the student group. On the other hand, students who consider themselves as performing well in their major complained about the 1:5 grouping system which made them do all or most of the work in any group assignment all by themselves, because everybody knows that they are the best. For example, one student said, "Three girls including me perform best in our class. Therefore, the rest of our group members expect us to do most of the work" (Seble, SP).

Several other students also raised the problem of copying one's work and putting the burden on someone who is considered the better performer. They raised this point from two points of view: the first was it over burdens the students who work alone; and the second, is it does not give the opportunity for everyone to take part and learn. This means there are some students who do not know anything about a topic but get full grades for a project that others in their group did. For example, Kalkidan, who is one of the outstanding students majoring in Manufacturing Engineering, said that the need of other students to copy her work not only affects her academic work load but also her social interaction with them. She said, "Because I do not allow them to copy my work …, they do not like me and we do not have a good relationship" (Kalkidan, SP). She also added, "Everybody wants to take advantage of the person who better performs academically." This puts such students under unnecessary workload and consumes their time unreasonably.

Residential Experience

Most public universities in Ethiopia follow a similar policy of student residential placement, which is based on students' gender and their majors. Similarly, all of the student participants in this study live with girls and most of them with their department mates. In this

case, it is not possible to see the students' residential experience separated from their other experiences.

In many cases, residential buildings were assigned for a school or a program-at-large based on the number of students they serve. For example, one building was assigned for Civil Engineering majors where there were the largest number of students, and one for College of Medicine and Health Sciences. The intended plan was for four students of the same gender and same major to share a dormitory, but, in some cases, three students shared a room.

Every building had two proctors who work in two shifts. They were in charge of making sure the students are well and safe in their residential building. The head of the proctors said,

> We are like their guardians as long as they are in their buildings, we are in charge of making sure that every girl is assigned to a dorm, they are safe and secured, they have all the utilities they need, they are living in peace and harmony with their roommates, and we also make sure that they utilize the university's properties appropriately. (Almaz, RP)

All the proctors interviewed explained that their relationship with the students they look after is like a mother and a child. The proctors were all very young and not much older than the students themselves, but they feel like they have motherly responsibilities to take care of the students. One of the proctors said,

> … the students even discuss with us their personal issues like being in love with someone or feeling like dropping out and the like, and ask for our advice. We are always there to help them in any way we can. If we can't give solution by ourselves, we report the case for the higher responsible body. (Sisay, RP)

Another proctor also said,

> … we are like mothers to them. Sometimes they may have difficult exams and feel so tensioned and given up. We are there to support them and give them strength. This makes them have sense of belonging and a feeling of being loved and taken care of. It helps them a lot to recover fast from the anxiety caused by hard course expectations. (Beza, RP)

Although the proctors shared such a relationship with students, the students did not say much about having such relationships with their proctors except about how they keep track of every student's presence in the dorms assigned for them.

The students' residential experience was strongly tied to their academic work. As was discussed in previous sections, they mostly do their academic work in their rooms, individually and in groups, which will be discussed in the following sections. Also, there was a trend: they napped in their dorms in their spare time, and between classes. Others explained that since there was no convenient recreational center on campus, they use their dorms as movie theaters. They watched movies on their laptops, individually and in groups.

Room culture. As was discussed above, most of the student participants shared the fact that their dormitories were more than rooms to spend the night in. Rather, their dorms were study spaces, recreational centers, and rooms to collaborate for group activities. We can see the room culture from three perspectives: 1) students' regional background, 2) their religious and ethical background, and 3) academic performance.

To begin with the first one, students were usually assigned to universities that are closer to their hometowns. An official interviewed from MoE said the ministry does this for different reasons. He said, "One reason is to make college transition easier for the students as they will be living closer to their family, another reason is to increase student intake capacity by minimizing

demands for in-campus residence as students from the town of the university should live off-campus or with their families" (Mesfin, MR). Talking about the problems identified related to this assignment he added:

> [H]owever, we realized that this system has created a problem that those who come from far regions are very few and are in some cases discriminated by the majority of students, and the general university community including faculty. At the same time, the majority of students from same towns and regions unite for negative purposes and cause troubles for the university as a whole. We are trying to develop some better ways of doing the student assignment to alleviate such problems. (Mesfin, MR)

The official didn't hide the fact that this problem is not only with the student population, but also with the faculty. He said,

> [O]ur faculty recruitment policy was to make the faculty population as diverse in regional back ground as possible by motivating more women while recruiting other supporting staff mostly from the local community. However, we just recognized that the majority of the faculty are from the same region where the universities are and there were times where some faculty discriminate students against their regional background and unite with or lead students for negative purposes. (Mesfin, MR)

Similarly, as the university investigated in this study resides in Addis Ababa, the majority of students are from this city. Only five out of the 15 student participants in this research came from outside Addis Ababa, and a few of them showed the effect of their regional background on their residential experience and the culture in their dorm. For example, one participant from a region far in the north said,

> I am the only person who is not from Addis Ababa and I had hard time getting close to my roommates who were all from Addis Ababa. They had somehow similar experiences and exposures to things so they understand each other easily, which at times made me feel awkward. (Nigisty, SP)

She added,

> It is sometimes too hard to be the only one or among the few staying in the residential buildings or in the entire campus. As you know, classes do not start until two-three weeks after we are admitted to campus, and there are also times with lesser work load and everyone goes to their family to spend some time leaving us to be all alone; these times are so tough. (Nigisty, SP)

There was also another student who shared a similar experience. Talking about her first experience as a person from a neighboring region to Addis Ababa, she said,

> I thought my hometown is almost like Addis Ababa, so I never expected to face difficulties based on where I came from. However, being the only person from a different place in a group of students who feel more connected to each other than to me was hard at the beginning. I had some hard times until I find a few girls from my hometown who made me feel better. After a while, it became easier even in my dorm because I got to know my roommates more and we became very close friends. (Eyerus, SP)

Another student from a region also said that at times she "felt lonely and neglected" (Efrata, SP).

The proctors also talked about the problems related to the girls' regional background. One proctor said, "Students from other regions are very few in number and they feel very lonely and some of them become homesick during the times, where the majority of students from Addis

Ababa or those who have relatives here leave for their homes" (Hagere, RP). Such problems are actually more affecting until the students get closer to each other and make friends.

The second perspective to discuss about room culture is based on the students' religious backgrounds and other behaviors. Students were not grouped based on their religious, ethical, or behavioral backgrounds. Thus, these characteristics were sorted at random, as they were not related to major. As a result, students talked about both the positive and negative effects of such a variable in their residences. The evidence showed that there was tolerance and respect among religious differences, but behavioral intolerance was one of the major problems that affected the harmony among residents. To begin with the religious tolerance among students of different religions, one student said,

> [W]e have a very nice combination of girls in our room. We support each other in many ways putting our differences aside. For example, one of my roommates is a protestant Christian while the three of us are orthodox Christians. We respect each other's faith and she understands when we need privacy for group prayers or some special feasts. We also do the same for her. (Markan, SP)

One of the two Muslim student participants, Hanan, also explained a similar experience. She talked about how respectful her roommates were of her faith and she appreciated it by saying,

> I usually spend most of my time with my roommates except meal times because I dine with my Muslim friends.[6] I can freely do my prayers in our dorm with no disturbance. They may also leave the room for me if I have some group prayer or gathering with my Muslim sisters, for example in our holidays. (Hanan, SP)

[6] In the Ethiopian culture, Muslims do not eat Christians' food and vice-versa especially if it is any type of meat. This is because the animals are blessed by a religious prayer before being slaughtered.

One big source of disagreement among roommates was the difference in their behavioral background. Many of the student participants and residential proctors discussed the problem caused by some unacceptable behaviors of some students. One student said,

> I saw so many weird things some students do. They are always out partying, they got drunk, and disturb the building and worst of all, their roommates. … These students with bad behaviors have strong influence on other students who know nothing, so I personally do not like to be close to them, and I do not want to live in their dorm. There were some students who were very decent and know nothing bad, they never even used chap sticks[7] but finally ended up being all time party girls changed their life, missed their life track, and get dismissed. (Rediet, SP).

The students who follow the accepted behaviors complain about students who engaged in riskier behaviors. In addition to the disturbance, they have another reason to complain. One student said,

> I am very much scared of living close to students with any type of addiction or bad behaviors; because I knew a girl who didn't know anything, she was even very amazed by the girls who had boyfriends[8] as she never had one. But, she is now completely changed, she smokes cigarettes, she has many ex-boyfriends now. (Meseret, SP)

Similarly, another student also shared her concern about negative peer influence. Talking about how serious the problem is, she said,

[7] Lip glosses are commonly called chap sticks in Ethiopia, and this student considered wearing a lip gloss as wearing some other make ups or more, which in an Ethiopian context is considered as adding some artificial beauty and not appreciated.

[8] Having a boyfriend or girlfriend is not a behavior good school-aged students would do. Even if someone has a boyfriend or a girlfriend, it is not something to speak about in public or with parents before graduating and earning money independently.

> Worst of all, they (students with bad behaviors) may drive the rest of their roommates to their bad behavior through time. For example, I know students who live with smokers[9] who managed to resist the influence of smoking for two years but started smoking in the third year, which is very sad. (Bezawit, SP)

The students who act out of the expected behavior, for example, those who smoke, or drink alcohol, are very few in number but are capable of making trouble for the entire building. One proctor said:

> [W]e are sick and tired of students who come drunk late in the evening making loud noises. Such behavior is not acceptable in the residences and we give them oral and written warnings. In the meantime, if we get many complaints from their roommates, we move them to a different dorm with a last warning. (Zebider, RP)

The proctors have another challenge regarding the behaviors of some students. Most of them complained about the routines of finding students in a different dorm than they were assigned. The major reason students are not in their rooms is that they wish to smoke, binge drink, etc., so they make a room of their own with girls of similar behavior where they can freely smoke, drink or party in this new room. This, according to the proctors, was a problem by itself. The head of the proctors said,

> [T]his might seem good for the rest of the students to avoid disturbance and negative peer influence. However, it makes it worse for the students who practice such behaviors to be drowned in there giving them no chance to stop their bad conducts. I never saw a girl shifting from her bad behaviors; instead, most of such girls usually get dismissed or dropout early in their program. (Almaz, RP)

[9] Smoking is not an acceptable behavior in Ethiopian culture, and someone who smokes is considered as a bad guy. It is even worse for women smokers, so it is not something that women would do in public.

Although the proctors said they took measures to correct students who had unacceptable behavior, some students who were disturbed by those who have unacceptable behaviors thought that a serious consequence should be taken for behavioral misconduct. For example, one student who was also the chair of the Students' Union said,

> [S]ometimes there is no control over students who come to residence buildings and dormitories drunk and disturb the entire building. No serious measure is taken for their behavior. I think this is not good for other students; you cannot study in your dorm where a student came drunk screaming and saying bad words. (Bezawit, SP)

The last perspective to discuss about room culture was the perspective of students' academic performance. The student participants were asked how they perceived themselves based on their academic performance. The students perceived themselves at different levels ranging from poor performer/struggling to outstanding. They also described that there were girls at different academic performance levels in every dorm. This means that there was no single dorm with all outstanding girls or all struggling girls. This implies that there is certain type of interaction among girls in a room affected by each student's academic performance. Discussing the advantage of living in same-major dorms, all the participants shared that they support each other in such a way that a girl who better understands a concept or a course helps the other girls understand it as well. However, most of them talked about copying the work of others whenever they felt a person can do the work better than the rest of them. Some consider it as a disadvantage of living in same-major rooms which requires them to be very close to each other to the extent of being unable to say no, and some do not. For example, one student said,

> I do not consider it as a disadvantage but some professors say that it exposed students to copy work from one another. I believe, … that as far as it is not a mere laziness, it is

> normal to copy some stuff that you couldn't understand at a point before the deadline, but trying to understand the concept later (Bethel, SP).

On the other hand, another student, Rahel, said that there is more chance of copying assignments, which she described as the only disadvantage of living in a same-major dorm. If the person who is considered the best doesn't allow the rest of the dorm members to copy her work, "they will not like [her]" (Kalkidan, SP) which affects her other social interactions with her roommates.

Academic integration. Most of what is discussed in previous sections, such as the students' interactions with others in academic and social settings, has a lot to do with the students' academic integration. Several of the students who chose to be grouped with their female colleagues for assignments and projects did so because it is easier to meet to collaborate. For example, a student said she felt "… more comfortable when grouped with female classmates, especially my dorm mates. Whenever possible, the four of us in one dorm form a group and add others if the groups are larger" (Seble, SP). The majority of the students agreed that their living environment positively affected their experience academically and socially. For example, one student said, "Living with classmates creates an opportunity to study together, to support each other both academically and emotionally, and to feel a sense of belonging" (Nigisty, SP).

All students, except those in Medicine, Health Sciences, and computer science, do not know their specific majors before the second semester of their freshman year. In the very first semester, in engineering for example, they took similar pre-engineering courses and were assigned to a specific engineering major based on their choice and their grades. Once they were assigned to their majors, they were no longer with the same girls in one dorm. They are placed in a new same-major dorm in their sophomore year. This different residential setting made it possible for the girls to compare the different living experiences. One participant, who talked

about the details of her experiences both in her mixed-major and same-major dorms, was asked which one she preferred and replied, “Living with my department mates is much better, you can’t even compare the two” (Markan, SP).

Social integration. The students’ residential experience was very much integrated to their entire college experience. All of them agreed that their way of living helped them easily transition to college. It made it easier to make new friends and to build intimacy and trust in their friendship. One student who went to girls-only schools explained that she was so worried about college life prior to attending. She said,

> I expected a very scary life in campus at the beginning, but I found it not as difficult as I thought it would be. … I believe that the way we lived in our residences has contributed a lot to this. (Seble, SP)

In general, most of what the students said had a sense that their living in a same-major residential arrangement had helped them develop a more intimate learning environment in the big campus where it is difficult to make friends.

The benefits of living in same-major dormitories, as discussed by the participants, were collaboration and avoiding negative peer pressure, while taking advantage of positive ones. They agree that when they were in a same-major dorm they usually had the same schedule because they had classes, exams, assignments due, or free time all together. This, they believed, gave them no chance to oversleep, or have a party while everyone in the dorm and/or next dorm were studying hard for exams or projects. One student said,

> However confident I am on myself, I believe that the person I spend more time with can drive me on his/her own direction. So, I believe that all of us having the same schedule has helped us to collaborate and plan together. (Kalkidan, SP)

One participant added another perspective, the advantage of living in a same-major dorm to keep posted on any departmental updates. She said,

> When living with your classmates, you will not miss any important information about what is going on in the department or what is up to the professors and what is due when. … When I was living in a mixed-major dorm, there were times that I missed classes. The class schedules were tentative at first and I didn't follow the updates. No one could tell you and you will miss class while everyone else attended. …. Living with our classmates, we all talk about similar things and if one misses the information, the other will have it to share it with the rest. We will know when class is cancelled and so on. (Efrata, SP)

Another student added to this, emphasizing the positive peer influence. She said, "Even if I am not in a mood to study, the dorm environment will force me to do so because everybody else will be studying" (Efrata, SP).

With regard to collaboration and teamwork, one participant said, "… when we live with our classmates, we do so many things together. For example, if there is a concept the three of us do not understand well, we will definitely find at least one person who understands the concept better to help us either from our own dorm or next door" (Bethel, SP). Another student added, "living with our classmates has several advantages; we do everything together. Academic stuff, dormitory or social life stuff, and even our very personal stuff that we don't feel comfortable sharing with other individuals" (Martha, SP). Comparing it to living in a mixed-major dorm, one student said,

> If I live with girls from other departments, I will be influenced by them or do what they do. If I feel like the work load in other departments is lesser, I will regret to be in my department in which case we cannot be successful in our department because we are not

> happy in there. But now, if we have hard time at a course we all share the feeling, or if we have a very difficult exam or a hard assignment, we all complain together. We may even make fun of things that would have made us mad had we lived separately. This I believe helps us survive both the academic and the social challenges in college. (Markan, SP)

Summary of Analysis

The findings showed the multiple roles of residence halls in participants' lives. As there was no place with suitable settings for collaboration and group work, the residential environment served both as a living place and as a place to collaborate both academically and socially. Students' interactions in residence halls strengthened female-only interactions and same-gender intimacy, which is possibly true for male students. On the other hand, it may limit the female-male interactions and learning from a wider group of students. The findings also showed that the students' commitment to and interactions within their residential environment affected their academic performance and strongly influenced some of the students to persist in their programs. This shows that, as Tinto (1975) asserted, the residence halls, as a segment of the multiple campus communities, provided a way for the student to become integrated into campus life.

One major finding of the study was the way the students choose their major and the relationship between being in a major of their choice and their academic performance. Although getting a major of their choice matters for the academic success of most of the students and their commitment in their major, this does not always mean that it is because they liked their major and made an informed decision. It may sometimes be because they simply made that choice and get placed in that major, which means that simply knowing that they got what they chose boosted their confidence. Two of the four students who were placed in the major of their choice

explained that they did not have any prior knowledge about the major they chose because they did not have someone to consult. Thus, their confidence and their high achievement is not only because they love their major, but also getting the chance to be placed in their chosen major boosted their confidence. They felt privileged and that they belonged in that major. This was one indicator that getting a major of their choice is a key element to increase the students' commitment to major, which in turn determines their success in that major.

Regarding the students' relationship with faculty, what was predominantly observed from the participants' responses was that the age of the faculty mattered for how they communicated with students and how comfortable the students felt to openly communicate with them. The students felt more comfortable talking to or getting close to young faculty than older ones.

Although the university wrote in the students' handbook that "the whole University community, in particular, the Student Affairs Directorate Director Office, the Gender Office, the Office of the Registrar, the schools, departments and most importantly instructors and advisors are there to serve and nurture [students]" (Students' Handbook, 2011, p.2), none of these offices and individuals were functioning well. Only the food processing engineering students acknowledged how supportive the dean of the school was for their academic and social issues. At the time data were collected, one of the offices, Students' Affairs Directorate, did not even exist because the university could not find a qualified person to hire in place of the former director who resigned months before. Similarly, the head of the gender office resigned nine months earlier. There is only one officer doing everything. Thus, she said she did not have the time to do any strategically important thing except the "very routine and of no use" activities (Haimanot, UR).

Regarding the role of resident proctors and their relationship with students, the findings showed that the proctors felt like they are the closest persons the students would talk to, just like a family member, by giving emotional support. However, they had a few complaints about the higher administrative body regarding the limitation of resources to function with their full potential. However, the students think the proctors' do more to control their daily activities in the residence halls than to support them. This might be because the proctors do not have relevant educational preparation in terms of counseling students on the social and academic problems they face. They are required to only complete 10^{th} grade in order to be hired as a proctor. The majority met this criterion, only a couple of them said they are studying part time to earn their associate degrees.

The other very important voice for better integration of women in their campus is the gender office. However, the findings showed that the office failed to play this role for lack of administrative support for the gender office and lack of initiation on the side of the students to visit and consult with the gender office.

Chapter Summary

This chapter discussed the findings of the study in four themes in terms of addressing the research question. There were different factors discussed in each theme that, in one way or another, affect the social and academic integration of students. Some factors have a positive effect to enhance the students' integration to the college environment while some of the factors were challenges to the integration process. As it is summarized in Table 5 below, such factors as negative stereotypes against women, limited faculty-student interaction, male dominance, and assignment to major without consent were found to have a negative effect on the social and academic integration of the students and also have a negative impact on their academic

performance and commitment to their majors. These negative factors, however, are mostly not related to the residence environment. They rather are more related to the students' classroom and other communal experiences. On the other hand, such factors as same-gender and same-major residence, the ease to find new friends and build stronger intimacy, and peer interaction were found to promote the students' social and academic integration which in turn helped them to better perform and persist in their majors.

Description		Positive Factors	Negative Factors
Individual Student Level		• Stronger intimacy with female department mates • Dependability on one another • Ease of finding accompany	• Persistent underrepresentation of women in the fields • Negative stereotypes • Limited interaction with faculty and relevant staff • Negative peer influence
Campus Level	Residence	• All same-major residence • All same-sex residence • Residence rooms serve as study rooms and collaboration spaces	• One region dominance
	Classroom and communal spaces	• All same majors take same courses every semester throughout their program • Peer collaboration	• Stereotypical labeling of students based on their gender • Male dominance both for students and faculty • 1:5 grouping • Restricted student-faculty interaction
	Facilities	• Separate buildings for men and women • Only four girls in a room	• Inadequate utility services • Lack of on-campus recreational options
System Level		• Same-gender, same-major resident assignment system	• Assignment to colleges and specific major without students' consent

Table 5

Summary of the factors that affected the social and academic integration of students

Chapter Five: Conclusions, Implications and Recommendations

Conclusions

Most studies in the area of residential environments, such as living learning communities (LLC), and their effect on student success focused on the cases of the United States and a few other developed countries. These studies showed that students who lived in LLCs had easier social transitions, better academic performance in their majors (e.g. Helman, 2000; Inkelas, 2011), and higher persistence in their major (e.g. Belichesky, 2013; Gandhi, 1999). Some of the studies which specifically focused on STEM living learning programs also showed that students who participate in such programs have better post-college STEM pursuits (e.g. Hathaway et. al, 2001).

However, there is no such study available focusing on an Ethiopian context. The purpose of this study was to investigate the experiences of women in STEM in an Ethiopian public university with particular emphasis on the effect of their residential environment for their social and academic integration and overall college success.

The findings of this study showed that the residential environment of the students played a great role for their social and academic integration, which in turn played a positive role for their persistence in their programs. It also identified some very important attributes that were missing but could have made the integration process easier and more positive. As was predicted by the theoretical framework section of the first chapter, the findings fit to the Integration Model of Residential Environment (Figure 2) adopted from Tinto's (1975) Integration Model. Figure 6 presents the summary of the model and its attributes based on the findings.

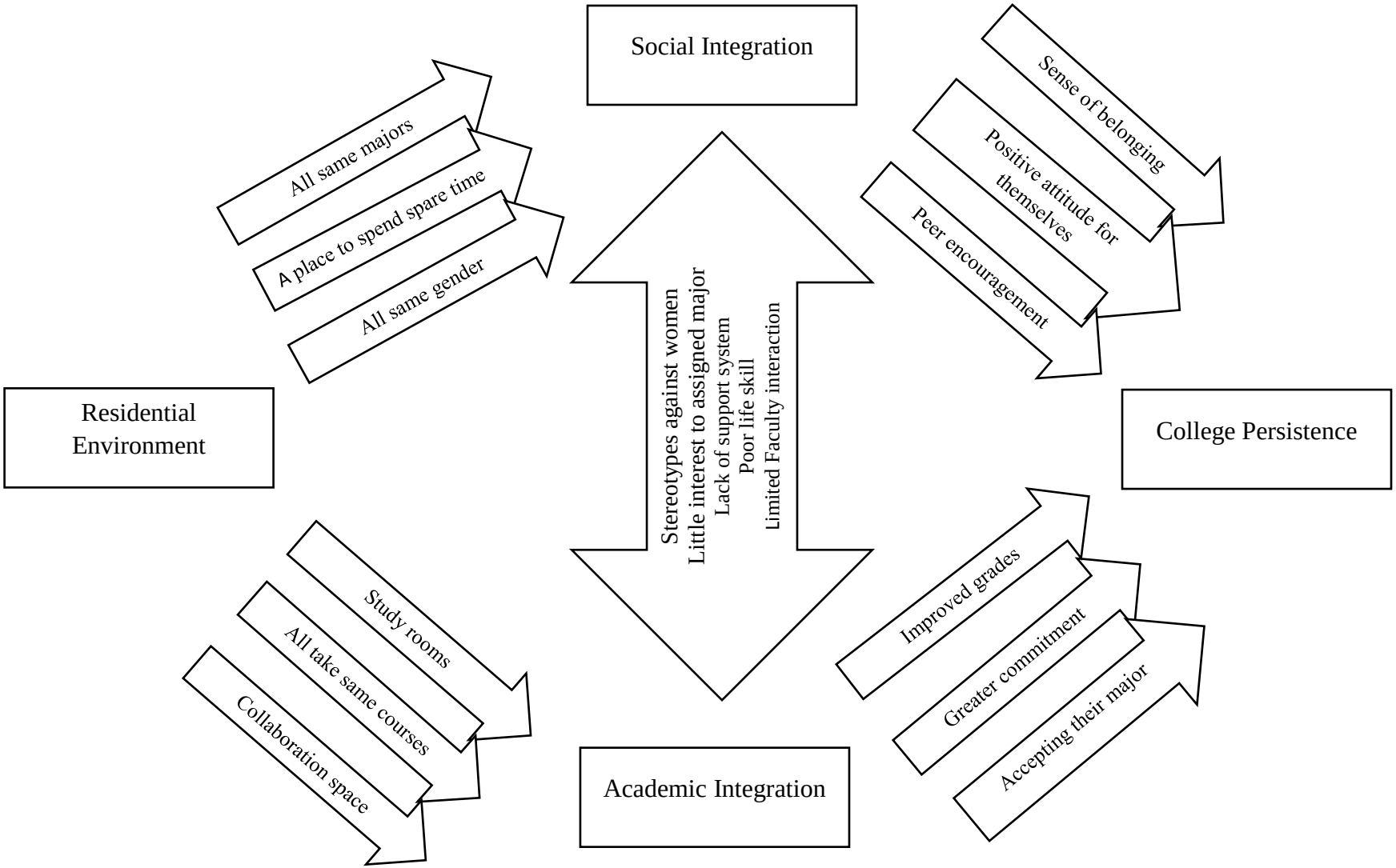


Figure 5. Integration Model of Residential Environment and Its Attributes

The participants of the study were 15 undergraduate women in science and engineering majors, five women residential proctors, and three officials from the university administration and from the MoE. This chapter will, therefore, summarize the major patterns in the findings following the themes discussed in the previous chapter. Under each theme and sub-theme, patterns will be described and will be compared to findings in previous literature for similarities and differences of application (Cresswell, 2012).

Gender Relations and Stereotypes

Several issues were discussed in the theme "Gender Relations and Stereotypes." Among them were the dating and sexual experiences of women and its effect on their academic performance, some common stereotypes that marginalize women in science and engineering, and the social, academic, and interpersonal interactions of women based on their gender.

The findings indicated that the socially gendered experiences of women is highly connected to and cannot be separated from their emotional and academic dynamics, reflecting the findings of other studies (Belichesky, 2013). Some of the student participants of this study mentioned that the gender-based stereotypical pushing forces in their majors influenced their self-concept, and sense of belonging in where they are. One of the reasons for those students to intend or wish to switch majors is their lack of sense of belongingness, which is directly or indirectly influenced by their related experiences.

In some cases, it was the women themselves who create hardship for other women. For example, some of the findings showed that there were women who believed that a girl cannot perform as well or better than boys in male-dominated fields like science and engineering. In some cases, scoring better grades did not even change this attitude, except that specific girl will be considered as unique or manly.

However, the study consistently showed that the residence halls had several academic and social advantages for the participants, including helping them cope with their gender-based difficulties. As different campus living arrangements can produce different kinds of interpersonal climates and normative peer cultures (Pascarella et. al., 1994), the fact that the participants lived with all females, in most cases, of the same majors, seemed to benefit them in socially, emotionally, and academically. It also boosted their confidence and their sense of belonging. Most of the students witnessed that their living arrangement linked their in-class and out-of-class experiences and promoted a smooth and friendly learning environment.

Further, regarding stereotypes, there were stereotypes that divide the specific disciplines in science and engineering as "appropriate" and "not appropriate" for girls. For example, some students explained that they were commonly told in their freshman year that majors such as manufacturing engineering, electrical and electronic engineering, electromechanical engineering were more appropriate for men than for women. It was advocated that it is better for women to select or be assigned to construction technology and management, civil engineering, or food process engineering majors. There is no scientific support for such classifications of science and engineering fields for men and women except a deeply rooted common stereotype. In general, the women mentioned the fields as feminine and masculine using different terms as "there is/no labor work," "it is easy" and the like.

Previous studies also showed similar results that while women are underrepresented in many STEM fields, the problem is worse in some stereotypically male-categorized fields such as the physical sciences and engineering than in life sciences. What this study added is that even fields in the engineering discipline are sub-categorized for men and women.

Low expectations for women, from peers and faculty, were also an important finding of this study. It was found that women were given lower expectations in their major because of their gender. As it is indicated in the literature (Robinson, Lubienski, & Copur, 2011) there were usually lower expectations for women in male-dominated disciplines, which in turn negatively affected the women's persistence in their major and their academic performance in that particular major.

Students' Academic Self-Perception and Commitment to Major

One profound issue discussed in this theme was the fact that the majority of student participants were assigned to a major that they did not choose. This affected their academic self-perception and their commitment to major. The four participants who considered themselves as "lucky" to be assigned to a major of their choice attributed their relatively higher grades to the fact that they liked their major, among other reasons, such as their working hard. However, most of the students chose their major without the knowledge of what it was about or what to do with it. Both the university administration and MoE know this truth and they confessed that it is a big problem to satisfy the interests of all students and what the country and the job market demand. They also believed that there is a lot to be done in helping the students make informed decisions when they choose a major.

Additionally, once the students made their choice and were assigned a major, they are left alone. They are responsible to solve their problems adjusting to a major they did not choose, or dealing with their social, emotional, or academic challenges in their assigned majors. Here, their company to one another played a big role. They all said that the way they live in their residence halls eased their feeling of loneliness, and their minority representation in their classroom settings.

Literature also showed that even in very challenging situations, students who participate in LLCs reported greater enjoyment of those situations than students in traditional residential environments (Inkelas & Weisman, 2003). Additionally, studies on women-only STEM LLCs reported higher levels of academic confidence and self-efficacy (Gandhi, 1999; Inkelas, 2011). Most of the participants of the current study also showed that the women who lived with their department mates reported being comfortable in their major and were at ease in dealing with the academic and social challenges they face. Previous studies supported this: Women in science and engineering LLCs had higher levels of satisfaction in their majors and feel more self-confident in their majors (Allen, 1999).

One interesting finding was the reasons for the students to choose a major or to be interested in a major, and to like or not like a major they were assigned in. They feel more comfortable in their major if they feel that there is high demand for that profession in the job market. This was not shown in any of the previous studies. Previous studies conducted in the US and other developed countries focused on showing the high demand of STEM professionals and how women were underrepresented in those fields. The reasons they discussed varied to a great range from gender-based barriers, to lack of role models and mentors, to family responsibilities (e.g. Cantor, 2010; Richman et.al., 2011; Snyder, 2012; Tsui, 2010). The case in Ethiopia, as was discussed in previous chapters, is different for different reasons, one of which could be the fact that students do not have all a say on what they want to major in, and the current problem on higher unemployment rate of college graduates (Dereje, 2010).

Other factors the participants of this study said influenced their decision to choose a certain major included positive role model and parental or family influence. In relation to this, studies on the underrepresentation of women in STEM showed that one of the barriers for

women not to be attracted to these fields is the lack of role models and mentors (Richman et.al., 2011; Zeldin, Britner, & Pajares, 2008). This confirms that the presence of positive role models influences women to be attracted to STEM fields and to feel more confident and successful in their major.

One other finding worth discussing is that the students' college entrance exam results and their first semester college GPA determine the likelihood of getting a major they choose. Complicating matters is the fact that every student and the entire college community knows about it. This means that students who were assigned to a certain major without their wills always feel that they are not academically competent. Furthermore, students who were assigned in most wanted fields (like medicine, electrical engineering, computer science), which demand higher grades, had better academic self-perception and higher confidence because everyone knows that they have higher grades. On the other hand, those assigned in least wanted fields (like education, agricultural sciences, or even some engineering majors) usually felt less competitive, and had lower academic self-perception and confidence in their major.

One other struggle the students had in terms of academic self-perception and commitment to major was that there were few to no women faculty members in their programs, which negatively affected their sense of belonging in their programs. Sonnert and Fox (2012) showed a similar finding that in fields with few other women students and few women faculty members, women were less committed to persist in that major and they achieved higher grades when there were more female faculty in the fields.

Students' Relationship with Others

This theme discussed students' interactions with each other, with faculty members, and with the rest of the campus community. These interactions were explained both in social and academic contexts and the students' integration in their college experiences.

In Ethiopian culture, there is very strong social interdependence within a community. The students' responses reflected this in many different ways. They mentioned several times that their perception of their campus experience was dependent on the nature (good or bad) of their interaction with others on campus.

Women were persistently underrepresented in all the cases of the participants' departments and they were closer to each other than to the men in their class. In most cases, they constitute only 15%-30% of the class. The fact that they were fewer in number and in mixed settings, combined with the stereotypes from male students and faculty, made them closer with each other than to anybody else.

In most academic settings, female students felt more comfortable working with other females. They worked with boys only when the group was formed by the faculty, or the popular 1:5 grouping where a groups of five students at different range of achievement levels are grouped together. On the other hand, dormitories were the most common places mentioned to play important roles for social as well as academic interactions of the participants. The fact that girls in the same major live together in a same dorm or residence hall made their living environment one in which social interaction and academics were highly valued and the need for studying be respected. A previous study mirrored this finding (Allen, 1999).

In most cases, the students mentioned that females sit together in a row or on one side of the classroom, and limited their in-class interaction to those sitting next to them, mostly with

other women. Similar to their interactions in classroom and residential settings, their interaction in their spare time was limited to certain activities. The most common activities mentioned by the majority of the participants included taking naps in their dorm, walking out with friends (unlike other settings, the students mentioned walking with men and women to the same extent) and have some refreshment, watching movies on their laptops, and going to their homes. There were, however, three special cases where two of the participants spent most of their spare time serving in the Student Union, and one other participant participated in the fashion industry as a model.

Students have very limited interaction with faculty, most of which was in-class academically-focused interaction. Furthermore, they were not very close to the gender office and other student support offices. Generally, the students' interaction was mainly with each other and to some extent with resident proctors. This shows that their main interactions happen in their residence halls and residence halls play great roles for the students' social integration.

College Experience

This theme discussed the participants' overall experience in the university campus. It discussed the college environment and how the students perceived it, and their experiences in classrooms and in their residence halls. As the university was recently established, there were several problems related to the fulfillment of infrastructure and even the student basic needs like water, and electricity. The university was so far from the city that the students could not go off campus to spend some time out. This negatively affected their college experience and their perception of the campus. On the other hand, it made them more dependent on each other because they had nowhere to go and nothing else to do in their spare time except hang out with each other. The students indicated several times that they turned to their peers in the residence

building for advice and, as Marchese (1986) said, they learn as much from one another through this as from the formal curriculum.

Most of what they said about their classroom experience was based more on their peer interaction than their interaction with the course instructors. They had limited-to-no contact with the rest of the university community, except for a couple of participants who participated in the university's Student Union. Their academic integration related to academic performance, involvement with the curriculum, and contact with faculty and staff (Walter, 1997) was to some extent experienced in their classrooms through a formal teaching-learning interaction with their course instructors. However, the residence halls played the most crucial role for their academic integration in such a way that they served as study halls, places for collaboration and group assignments, as well as venues for peer support and role modeling. Similarly, residence halls played a vital role in the social integration of the students since they were places where students spend the majority of their time together.

The libraries were very small in size and had only a few relevant books for the students to refer to for their courses. The relevant books in the library were so few in number that the students needed to stay on a long waiting list to access them for just an hour or so. As a result, the students did not use the libraries very often; they mostly depended on their lecture notes and the handouts from the course instructor. This was one factor that made residence halls more of a place to study and do most of the academic work than a place to only sleep.

Implications for Practice

Student Placement

Recently, there was a focus on placing most students in the universities in or near their home town. This had both positive and negative implications for the students' personal and

social interactions in the college environment. Such a strategy had advantages for the university administration by reducing the need for meal services and resident buildings, as students in their home town were not eligible for on-campus meal and residence services (Amare, Personal Communication, July 20, 2014). As most of the participants in the current study agreed, it eased their transition to college for students who lived closer to their family. However, this may put some groups of students at a disadvantage. Students from farther away from the university were, in most cases, fewer in number and they were discriminated against. Whenever there comes political unrest based on race and ethnicity, they will be the first targets to be attacked both by the university population and the surrounding community (Bejtual, 2007). This is a problem for the university administration as well, since problems related to racial conflicts were aggravated by the fact that most of the university community, including faculty and students, were from the same town where the university was located, or at least from the same region (Amare, Personal Communication, July 20, 2014). If MoE was to keep this trend of placing students in universities in or near their home town, they should all either be placed around their home town, or the distribution should be even (Bejtual, 2007).

Assignment of Majors

The findings in this study showed that students who were placed in a discipline and/or a major of their choice were academically more successful than those who were assigned without their choice. This is one thing that MoE and each university should take into consideration when reviewing their placement policies and making student placements. The trend of students' choices from the past few years with respect to the country's demand for specific professionals should be mutually considered in establishing universities and designing programs in all government universities to accommodate students' needs and the country's demands.

Dormitory Assignment

Residence halls have the potential to challenge and educate students as they connect their learning experience to their living realities. When residence halls are designed as purposeful educational settings, they can promote effective undergraduate education. Just adding a few more planned strategies to make the residence halls more like an LLC would help the students benefit even more socially and academically. Such additions might include assigning faculty and peer mentors and making available study rooms and collaboration spaces (Inkelas, 2011). The educational potential of residence halls is realized when students are challenged to become more competent and educated human beings both academically and socially (Marchese, 1986).

Faculty Retention

The majority of the university faculty were young and had only a few years of experience. The university official I talked to complained that some of the faculty use the university as a bridge to move to the capital, Addis Ababa, and go to other jobs. They do not stay long enough to be determined and focus on the long-term success of students and the growth of the university. A related problem shown in the findings was that there was a high rate of faculty attrition which may make it harder for students to form strong and long lasting connections with faculty and this could loosen the mentor-mentee relationship if there was any.

Mentoring and Orientation

The findings of the study showed that the majority of the faculty were young and students were more comfortable with younger faculty than the older ones. One possible implication, in this regard, is that the more comfortable the students are with the faculty, they will have a closer bond with them. Students would learn more through questioning, which they only feel comfortable doing with young faculty, and spending extra time on solving problems and seeking

clarification for the concepts they do not understand well. They may even feel more sense of belonging in their majors as they get more support from faculty. More specifically, female faculty and female students can easily develop a mentor-mentee relationship and role modeling will work more effectively through closely talking to each other about their academic and personal issues. Of course, there are other problems that would come with having more young faculty – it is hard to be young and simultaneously experienced.

Surprisingly, no student explained about the influence of the university or their schools, or teachers and professors, in making their decision to choose a certain major. They did not have any information about the different options to choose from, what each profession entails or what to expect in each field and the opportunities and challenges in each major. This is one of the major issues that stakeholders in the education system, at different levels, should consider working on for the future. The government, more specifically MoE, Ministry of Science and Technology, and Ministry of Women's and Children's Affairs, should work in collaboration to design better K-12 curriculum which helps children at different ages discover their talents and all the possibilities in STEM fields. Implementing new science and technology-focused policies should help future scientists and technologists make informed decisions on what they do and how they do it. Teachers, school administrators, guidance and counseling officers, and all other concerned bodies should work in collaboration to make sure that their students know what opportunities they have at hand and how to make their decisions. More importantly, universities should give more attention to guidance and counseling of their students, especially towards helping them know more about each major that they can choose from, what it means, what to expect, and what to do with it. There is no effort from the university faculty community to help the students know about what each major means and all the possible opportunities in it.

Therefore, it could be one thing the faculty can do to better prepare students make informed decision and do better in their majors.

Residence Proctors

The closest individuals to know what is going on with the students while they are on campus are the residence proctors. As they said themselves, they are like a second family for the students. However, the students' responses showed that the proctors were not integrated in the lives of the students as much as they thought they were. The proctors were not professionally prepared to support the students, most of them did not complete high school. The university could work on offering a special training for proctors on counseling skill development, life skills, and or other related skills so that they could be more helpful for the students and play the "second family" role as expected.

Recommendations for Future Research

In Ethiopian public universities, there are different ways of students' residences. There are many students who commute from their homes, some who live in an off-campus setting and some who live in campus residence halls. This study investigated the experiences of Women STEM majors who live in a college residence halls. This study highlights the need for future studies comparing effects of the different residential settings for the success of college students especially for women in STEM. Similarly, there are some public universities that do mixed-major dormitory assignments. Future research on how he different residential settings affect the performance and persistence of women in STEM would contribute a lot for the lack of literature on the topic on the specific Ethiopian context. In relation to this, this study recommends future research to develop a mechanism to make residence halls purposeful and intentional educational

environments so that, as Terenzini and Pascarella (1994) identified, such environments will have the strongest impacts on cognitive development and persistence of students who live in there.

In a general context, the findings from this study also underscore the need for additional research in the area of women's persistence in the sciences and of the impact of the college environment on women's experiences in STEM. Specifically, this study highlights the need for more qualitative studies focusing on the experiences of women who live in single-sex and same major STEM residence halls. imilar to Kahveci et.al.'s (2007) recommendations for future research in this area, this study also recommends the need for more "theory-driven qualitative" studies (p. 60). And similar to Belichesky's recommendations, by increasing the number of qualitative studies, more opportunities will exist for "women's voices to be heard in the research" (p.137). This in turn might result in a better understanding of their experiences in the sciences and in the ability to create impactful interventions to increase their success.

Limitation of the Study

As there is a dearth of literature describing studies of the Ethiopian higher education system, this study does not have a strong literature support in the Ethiopian specific context. Another limitation is that the time frame for data collection was too short and it was close to the final weeks of the academic year when students were overloaded with exams and other academic requirements.

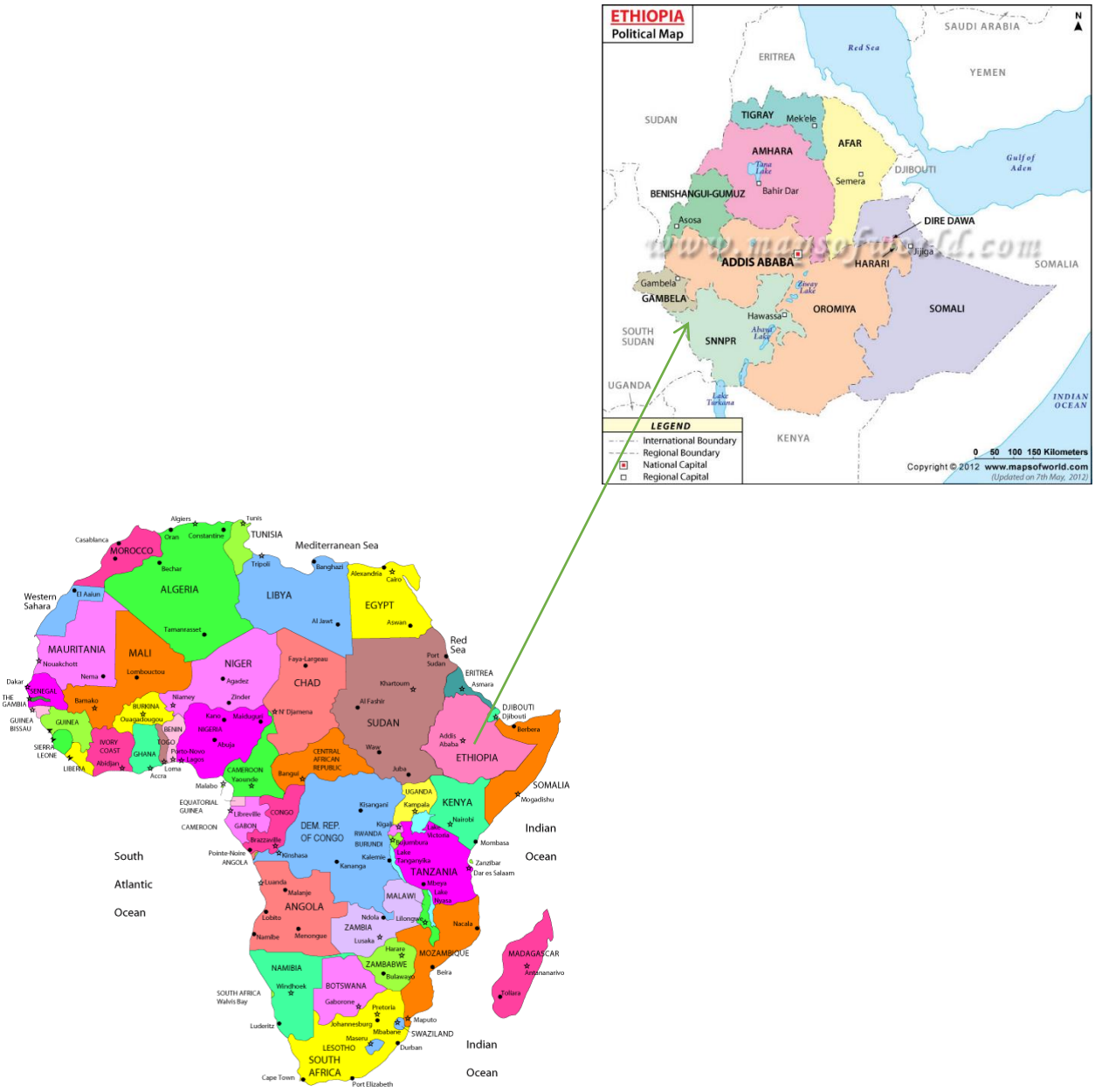
In addition, although building trust between the researcher and the participants is a very important issue in qualitative research (Bogdan, & Biklen, 2007), the limited time for data collection made it difficult to build sufficient trust between the researcher and the participants. One major limitation related to that is that there might be a possibility that people didn't come to see me because they were too busy or didn't like what they experienced and did not want to

share their negative experiences with a stranger. This has a potential to cause skewness towards getting more participants with positive experiences than those who have negative things to say. In relation to this, as data were collected out of the United States, where the research was written, it was difficult to go back to the research site when more information was needed. For example, it was planned to interview the director of the Gender Affairs Directorate of the MoE, but it was not possible to do that because the director was out of country and I could not go back to Ethiopia to do the interview when she was back. Besides, the study covers only one public university and due to the design of the study, it was not possible to make generalizations to other public higher education institutions.

Appendices

Appendix A (I)

Map of Ethiopia, its regions, and neighboring countries



Downloaded from:

http://www.google.com/imgres?imgrefurl=http%3A%2F%2Fwww.mapsofworld.com%2Fethiopia%2Fethiopiapoliticalmap.html&tbnid=oa64d5mxtc2jM:&docid=XEIAkVe7QH5KFM&h=780&w=800

Appendix A (II)

Map of the university area

Downloaded from: http://www.aastu.edu.et/index.php/about-aastu2/location-and-map

Appendix B

Timeline and Budget

Time line

Activity	Time Period
Defending the proposal	November, 2014
Review more literature	November, 2014
Transcribing interviews	December, 2014 – January, 2015
Coding the transcript and analyzing	February - March, 2015
Writing major findings	April - August, 2015
Writing discussions and implications	September - November, 2015
Sending the first draft for the committee	January, 2016
Reader ready	February, 2016
Oral presentation	March/April, 2016
Final revision	April, 2016

Budget

Item	Quantity	Unit Price (USD)	Cost (USD)
Air fair	1	1,800.00	1,800.00
Researcher allowance	3 months	500.00	1,500.00
Voice recorder	1	50.00	50.00
Stationary	-	100.00	100.00
Data coding software	1	150.00	150.00
		Sum	**3,600.00**
		Miscellaneous	**360.00**
		Total	**3,960.00**

Appendix C

Schools and Departments in the university

	Name of the School	Departments for Undergraduate Studies	Departments for Graduate Studies
1	Business and Management		* Construction Management, *Industrial Management, Engineering Management, *Project Management, *Entrepreneurship and Small Business *Development, and Executive Management areas.
2	Civil Engineering & Construction Technology	*Civil Engineering Department * Construction Management &Technology Department	*Structural Engineering * Construction Management * Road & Transport Engineering * Geo-technical Engineering * Hydraulics Engineering
3	Architecture & Urban Design	*Architecture Department * Urban Design &Planning Department	
4	Information Science &Technology	*Computer Engineering Department *Computer science & IT Department *Electrical & Electronics Engineering Department	
5	Chemical & Material Sciences Engineering	*Chemical Engineering Department *Food Processing Engineering Department	
6	Mechanical & Manufacturing Engineering	*Electro-Mechanical Engineering Department *Manufacturing Engineering Department	

7	Environmental &Power Resources Engineering	*Environmental Engineering Department * Water Supply & Sanitation Department	Environmental Engineering
8	Earth & Planetary science &Engineering	*Geology Department *Mining Department	
9	Biological & Chemical sciences &Technology	*Biotechnology Department * Eco-biology Department *Industrial Chemistry Department *Food Science	
10	Medicine & Health Science	*Public Health Officers Department *Nursing Department	
11	Interdisciplinary Programs		

Appendix D

Interview Protocol for Student Participants (English Version)

My name is Frehiwot Wuhib, a PhD student at Syracuse University. I am interested in understanding the dormitory experiences of undergraduate women in Science, Technology, Engineering, and Mathematics (STEM) majors with regard to their academic achievements. Any information gathered through this interview will be kept confidential and will be utilized for the research purpose only.

1. Tell me about yourself.
    i. What is your major?
    ii. What year did you start your program?
    iii. How is your academic performance in your program?
    iv. Are you in a major of your choice? If so why did you choose this major and do you still fill the same? If not, what was your preferred major?
2. How is your classroom experience both with professors and classmates?
3. How do you find campus life?
4. What do you usually do in your free time when you are not studying, going to class, or doing homework?
5. How do you describe your dormitory experience?
    i. What is your opinion on the way you are assigned to your dormitory?
    ii. How do you describe your life with your current roommates and students in your building?
6. What do you think are the advantages and disadvantages of the current residential arrangements?

i. academic,

ii. social, and/or

iii. interpersonal

7. Could you recommend to me of other students whose experience might be useful for me to know about?

Appendix E

Interview Protocol for Student Participants (Amharic Version)

ስሜ ፍሬሕይወት ወንድሙ ዉሂብ ይባላል። አሜሪካ በሚገኘው ሲራክዩስ ዩኒቨርሲቲ የዶክትሬት ተማሪ ነኝ። በመንግስት ዩኒቨርሲቲዎች የሚገኙ ሴት የሳይንስ፣ ቴክኖሎጂ፣ ኢንጂነሪንግ፣ እና ሒሳብ ትምህርት ዘርፍ ተማሪዎች በዩኒቨርሲቲ የግቢ መኖሪያ አካባቢያቸው ያላቸው ተሞክሮ በቀለም ትምህርታቸው በሚያስመዘግቡት ውጤት ላይ ያለውን ተጽዕኖ ለመረዳት ለጥናት የሚሆን መረጃ እፈልጋለሁ። የምትሰጪኝ መረጃ ምስጢርነቱ የሚጠበቅና ለጥናቱ አላማ ብቻ የሚውል መሆኑን አረጋገጣለሁ።

ለተማሪዎች የሚቀርብ ቃለ መጠይቅ ጥያቄዎች

1. እስኪ ስለራስሽ ንገሪኝ?
   i. ምን ትምህርት ክፍል ነሽ
   ii. መቼ ነው በዩኒቨርሲቲው ትምህርት የጀመርሽው
   iii. በትምህርት ክፍልሽ ውጤትሽ እንዴት ነው
   iv. በመረጥሽው የትምህርት ክፍል ነው የተመደብሽው? ከሆነስ እንዴት መረጥሽው? ካልሆነስ ምን ነበር ያንቺ ምርጫ?
2. በክፍል ውስጥ ከተማሪዎች እና መምህራን ጋር ያለሽ ግንኙነት ምን ይመስላል?
3. የዩኒቨርሲቲ ግቢ ሕይወትን እንዴት አገኘሽው?
4. ከትምህርት ወይም ከጥናት ሰዓት ውጪ በትርፍ ሰዓትሽ ምን ትሰሪያለሽ?
5. በማደሪያ ዶርም አካባቢ ያለሽን ተሞክሮ እንዴት ትገልጪዋለሽ?
   i. ዶርም አመዳደብ ላይ ያለሽ አስተያየት ምን ይመስላል
   ii. አሁን አብረውሽ ከሚኖሩት ልጆች ጋር ያለሽን ሕይወት እንዴት ትገልጪዋለሽ
6. አሁን ባለው በእንድ ዶርም የአንድ ትምህርት ክፍል ልጆች የሚመደቡበት አሰራር ምን ጥቅም እና ጉዳት አለው ትያለሽ?
   i. ከቀለም ትምህርት አንጻር
   ii. ከማሕበራዊ ግንኙነት አንጻር
   iii. ከግልና የርስበርስ ግንኙነት አንጻር
7. ጠቃሚ ልምዳቸውን ሊያጋሩኝ የሚችሉ ሌሎች ተማሪዎችን ልትጠቁሚኝ ትችያለሽ?

Appendix F

Interview Protocol for Higher Officials (English Version)

My name is Frehiwot Wuhib, a PhD student at Syracuse University. I am interested in understanding the dormitory experiences of undergraduate women in Science, Technology, Engineering, and Mathematics (STEM) majors with regard to their academic achievements. Any information gathered through this interview will be kept confidential and will be utilized for the research purpose only.

1. How are students assigned to dormitories in respective public universities?
2. Is it the same for all public universities in the country?
3. How was student residential placement been done before the implementation of the current system?
4. What is the rationale behind designing the current residential arrangement?
5. How do you evaluate the effectiveness of this system so far with regard to this rationale?

Appendix G

Interview Protocol for Higher Officials (Amharic Version)

ስሜ ፍሬሕይወት ወንድሙ ዉሂብ ይባላል። አሜሪካ በሚገኘው ሲራክዩስ ዩኒቨርሲቲ የዶክትሬት ተማሪ ነኝ። በመንግስት ዩኒቨርሲቲዎች የሚገኙ ሴት የሳይንስ፣ ቴክኖሎጂ፣ ኢንጂነሪንግ፣ እና ሒሳብ ትምህርት ዘርፍ ተማሪዎች በዩኒቨርሲቲ የግቢ መኖሪያ አካባቢያቸው ያላቸው ተሞክሮ በቀለም ትምህርታቸው በሚያስመዘግቡት ውጤት ላይ ያለውን ተጽዕኖ ለመረዳት ለጥናት የሚሆን መረጃ እፈልጋለሁ። የምትሰጪኝ መረጃ ምስጢርነቱ የሚጠበቅና ለጥናቱ አላማ ብቻ የሚውል መሆኑን አረጋገጣለሁ።

ለሚመለከተው የመንግስት ባላስልጣን የሚቀርቡ የቃለመጠይቅ ጥያቄዎች

1. በመንግስት ዩኒቨርስቲዎች የተማሪዎች የመኖሪያ ምደባ የሚከናወነው እንዴት ነው?
2. አመዳድቡ በሁሉም ዩኒቨርሲቲዎች ተመሳሳይ ነው?
3. አዲሱ የአመዳድብ ዘዴ ከመተግበሩ ቀድሞ የተማሪዎች የማደሪያ ድልድል እንዴት ነበር የሚከናወነው?
4. በአሁኑ ወቅት የሚተገበረው የመኖሪያ ድልድል የተቀረጸው ከምን አንጻር ነው?
5. ከተቀረጸበት አላማ አንጻር ውጤታማነቱን እንዴት ይገመግሙታል?

Appendix H

Interview Protocol for Residential Building Proctors (English Version)

My name is Frehiwot Wuhib, a PhD student at Syracuse University. I am interested in understanding the dormitory experiences of undergraduate women in Science, Technology, Engineering, and Mathematics (STEM) majors with regard to their academic achievements. Any information gathered through this interview will be kept confidential and will be utilized for the research purpose only.

1. Can you tell me about yourself and your responsibilities as a proctor?
2. How long have you worked in this position?
3. How do you describe the interaction of students within their residential environment?
4. Is there any change in trend over the years?
5. What advantages and disadvantages do you think the living environment have for the academic achievement of the students?
6. What do you suggest for dormitory assignment to better fulfill the academic and social needs of the students?

Appendix I

Interview Protocol for Residential Building Proctors (Amharic Version)

ስሜ ፍሬሕይወት ወንድሙ ዉሂብ ይባላል። አሜሪካ በሚገኘው ሲራክዩስ ዩኒቨርሲቲ የዶክትሬት ተማሪ ነኝ። በመንግስት ዩኒቨርሲቲዎች የሚገኙ ሴት የሳይንስ፣ ቴክኖሎጂ፣ ኢንጂነሪንግ፣ እና ሒሳብ ትምህርት ዘርፍ ተማሪዎች በዩኒቨርሲቲ የግቢ መኖሪያ አካባቢያቸው ያላቸው ተሞክሮ በቀለም ትምህርታቸው በሚያስመዘግቡት ውጤት ላይ ያለውን ተጽዕኖ ለመረዳት ለጥናት የሚሆን መረጃ እፈልጋለሁ። የምትሰጪኝ መረጃ ምስጢርነቱ የሚጠበቅና ለጥናቱ አላማ ብቻ የሚውል መሆኑን አረጋገጣለሁ።

ለመኖሪያ ሕንጻ ተቆጣጣሪዎች የሚቀርቡ የቃለመጠይቅ ጥያቄዎች

1. ስለራስዎትና ስለስራ ሀላፊነትዎ ሊነግሩኝ ይችላሉ?
2. በዚህ የስራ መደብ ለምን ያህል ጊዜ ሰርተዋል?
3. በመኖሪያ ሕንጻው አካባቢ የተማሪዎችን ግንኙነት እንዴት ይገልጹታል?
4. ካለፉት ዓመታት አንጻር በተማሪዎች ግንኙንት ረገድ የሚታይ ለውጥ አለ?
5. በአሁኑ ሰዓት እየተሰራበት ያለው የተማሪዎች የመኖሪያ ድልድል ለተማሪዎች ውጤታማነት ምን ጥቅምና ጉዳት አለው ብለው ያስባሉ?
6. ተማሪዎችን የበለጠ ውጤታማ እንዲሆኑ ከአመዳደብ ረገድ ምን ቢደረግ ጥሩ ነው ይላሉ?

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