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Understanding Why Women Stay: Examining Persistence Factors of Women Majoring in Science and Technology Programs in Public Ethiopian Universities Using a Mixed Methods Design

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Abstract

Amongst African nations, Ethiopia is a unique case in many respects. The country has the second largest population on the continent, is currently experiencing an economic boom, and is a relatively stable nation in the geopolitically volatile "Horn of Africa" region. In the past two decades, the higher education sector in Ethiopia has experienced rapid growth, as evidenced by an increase in both student enrollment and the number of universities. Amongst the various types of higher education institutions, public universities are especially important because they receive the greatest financial support from the Ministry of Education. Moreover, science and technology programs are uniquely situated within the public higher education system because 70% of public university students are required to study a science or technology discipline. Despite increased student enrollment, a rise in the number of institutions, and an increased focus on science and technology in education policy, women remain starkly underrepresented in these fields. This dissertation explores the experiences of women in undergraduate science and technology programs by asking the question: what factors help women persist in undergraduate science and technology majors at public universities in Ethiopia? In addition to the central research question, the following sub-questions were also examined: 1) How do participants describe their everyday, lived experiences as women in science and technology? 2) What aspects of campus life help women succeed in these disciplines?, and 3) How do women seek out and find institutional and social support at the various stages of their education? Postcolonial feminism and the "Circles of Progression Model" from Jama, Mapesela, and Beylefeld (2008) are used throughout this work to inform the literature review, data collection, analysis, and recommendations.

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Key words: women, Ethiopia, higher education, science, technology, persistence.

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Chapter 1: Introduction

Women are part of a marginalized group in science and technology education in Ethiopia. Thus, the discourse about them is often deficit-based, focusing on their shortcomings (Molla & Cuthbert, 2014; Negash, 2006; Saint, 2004; D. Teferra & Altbachl, 2004; Seyoum Teferra, 1986; Wondimu, 2004). I hope to disrupt the pathologizing discourse about minoritized students that often reproduces, magnifies, and exacerbates poor performance (Solorzano & Yosso, 2001). Accordingly, I have chosen to focus on factors that have led to their success despite the numerous obstacles they face. In his study titled "Niggers no more," higher education scholar Shaun Harper challenges the dominant discourse about the social and educational achievement of another marginalized group – Black men in the United States (2009). He posits that educational research that focuses exclusively on the underachievement of Black males presumes that their underachievement is fixed. To this end, he argues "…there should be something embarrassing about publishing only deficit-laden scholarship that depicts Black men as 'at risk,' disengaged Niggers" (p. 709). Heeding Harper's admonition, I hope to frame the achievement of women in higher education as both an achievable and necessary dimension of Ethiopian society. Women are graduating with science and technology degrees, and although their number might be small, their stories matter and need to be shared.

In Ethiopia, the educational system that women must navigate is closely tied to the political history, federal governance, and local governance of the country. For many centuries, monarchs ruled Ethiopian society. In 1971, the reign of Emperor Haile Selassie was overthrown by a military coup led by Colonel Mengistu Haile Mariam, a Soviet Union-backed socialist revolutionary (A. M. White, 2011). In May of 1991, another important government shift took place when a coalition of four ethnic-based movements called the Ethiopian People's Revolutionary Democratic Front (EPRDF), overthrew Haile Mariam's military council and established an ethno-nationalistic republic. In this government regime, the various ethnic groups (or nationalities) of the country were granted more economic equality and political autonomy (Aalen, 2014; Abbink, 2009). By 1994, a federal constitution was created and the Federal Democratic Republic of Ethiopia became an official nation state. The ethnic federation is a defining feature of Ethiopian life because fiscal allocations, civil society administration, and educational policies are designed according to the linguistic and geographic boundaries of about 80 ethno-linguistic groups (Abbink, 2009).

Presently, Ethiopia has one of the fastest growing economies in the world, but despite this current growth, decades of prior conflict, lack of investment, and isolation from the global economy have kept Ethiopia's per capita income one of the lowest in the world (Gündüz, 2016; Kushkush, 2015). As Ethiopia's economy has rapidly grown over the past ten years (Bachewe, Berhane, Minten, & Taffesse, 2015; Krishna, 2016), the federal government has pushed for the increased participation of girls in primary and secondary education in order to promote additional economic growth. As is the case in

many other developing nations, government leaders and international stakeholders in Ethiopia recognize that educated women improve the size, quality, and productivity of a country's workforce (Matsui, Suzuki, Tatebe, & Akiba, 2014). Consequently, there have been a variety of government-funded Ministry of Education (2011) projects that specifically focus on girls' primary and secondary educational attainment, including:

1. *The Social Assessment for the Education Sector* – a multisite study completed in partnership with Great Britain's Department for International Development (DFID). Findings from this project demonstrated that some of the main barriers for equity and inclusion of girls in school are poverty, food insecurity, child labor, and distance from secondary schools (Jennings, Mekonnen, & Feye, 2010).

2. *The National Girls' Education Strategy* – a document that provides recommendations for how to increase the number of girls in science and technology fields. These mechanisms include curricular reform, increased research about gender in education, and granting women preferential admission into teacher education programs (Ministry of Education, 2011).

3. *Achieving Gender Parity in Education* – a policy assessment for international stakeholders, local governments, and federal government leaders. Conclusions suggest that female students are disproportionately affected by financial constraints when compared to their male peers (Ministry of Education, 2011).

4. *Education Sector Development Program* – a policy agenda with an emphasis on gender-sensitive curriculum and promoting representation of women in leadership positions (Haileselassie, 2009).

Overall, these national projects which combine research and strategic planning, are used to identify challenges to gender equality and design educational policies aimed at increasing the number of girls who enroll and stay in school. While all of these projects are valuable and potentially contribute to the overall aim of gender equity, they generally fail to capture the experiences of female students in public higher education and focus on primary and secondary education. The disconnect between existing research and policy development and the espoused policy priorities of the Ethiopian government is worth interrogating for the following reasons. For instance, the Ethiopian government's investment in education is evident in the way federal funds are appropriated. A significant amount of the country's gross domestic product (approximately 4.5%) is used for education (Knoema, 2016). This government expenditure on education is used for administration, subsidies for private institutions, and support of public institutions. While a significant proportion of this public expenditure for education is allocated to primary education (28.4%) and secondary education (17.1%), the bulk of funds are used for higher education (43.9%) (Knoema, 2016). In order to gain a more comprehensive understanding of how gender influences educational attainment in Ethiopian education, researchers must shift their gaze to higher education.

Positioning of Gender in Science and Technology Discourse

As the education sector has grown, substantial progress has been made in STEM research and development. Government leaders have made it clear that science and technology industries are fundamental parts of the country's plan for economic development. For instance, the federal government has spearheaded the "Agriculture Led

Industrialization Initiative" national strategy to promote development through agrarian efforts (O'Keeffe, 2017). Meanwhile, the Ethiopian Ministry of Education ranks Jimma University first in research and educational outcomes in agricultural development and industrialization. In 2013, Jimma University established the Department of Materials Science and Engineering which has been especially successful in meeting the STEM needs of the country by carrying out projects such as the development of carbon nano-materials for construction and super-capacitors that provide electricity (AASTU, 2015). Similarly, faculty from Addis Ababa Science and Technology University have been involved in a multitude of science and technology projects, including the mapping of erosion hotspots using GIS, methods for reducing soil loss in the Blue Nile Basin, and small-scale irrigation projects (Mekonnen & Melesse, 2011). Research centers at other universities—such as the Institute of Technology at Addis Ababa University, the Bahir Dar Institute of Technology at Bahir Dar University, and the Ethiopian Institute for Architecture, Building Construction and City Development in Addis Ababa—are also committed to technical innovations that will serve the infrastructural needs of the country (AASTU, 2015).

Within the context of the social and economic needs of the African continent, Ethiopia's commitment to science and technology education makes sense. Science and technology development is one of the most important currencies of international trade. In Africa, STEM higher education is needed to address the social, health, and developmental priorities of many countries. For example, a heavy disease burden lowers life expectancy and restricts economic growth across the continent. Researchers from the

World Bank explain that lower respiratory infections, malnutrition, and newborn/maternal diseases continue to be major health concerns, especially in lower-income sub-Saharan countries like Ethiopia (2013). Historically, however, international pharmaceutical companies have not allocated significant research funds to find cures to many infectious diseases endemic to Africa because of an assumed low financial return on investment (Hotez et al., 2016; Mackintosh et al., 2018; Mitchell, 2001; Peter, 2017; Yamey, 2002). In addition, there is a paucity of skilled professionals to meet the demands of expanding sectors such as the telecommunications, water, energy, climate, agriculture, and extractive industries (Chibale, 2015; Watsa, 2014). In sub-Saharan Africa alone, there is a need for 2.5 million technicians and engineers to work towards establishing sanitation and clean water practices (Bailey, 2011).

While there is a need for skilled students' (including female students') participation in the science and technology field, much of the education literature about best practices for supporting women in science and technology does not consider the unique context of education in countries like Ethiopia. For instance, some scholars have focused on creating gender equity in curriculum and pedagogies (Baker, 2013; Blair, Miller, Ong, & Zastavker, 2017; Espinosa, 2011; Knight, Mappen, & Knight, 2011; Marginson, Tytler, Freeman, & Roberts, 2013; Parson, 2016; Rosser, 1993). In order for curricular and pedagogical transformation to occur, many of these scholars argue that authority figures in STEM classrooms and departments must move from mere recognition of gender disparities to a consciousness of how male hegemony has shaped the nature of STEM-based inquiry (Marginson et al., 2013; Rosser, 1993).

Amongst these pedagogical strategies, one highly recommended by scholars has been to train teachers to become more aware of gender disparities in STEM so that they will not unintentionally discourage young girls from pursuing higher education in this field. Since men and women's sense of self-efficacy develops differently, it is important that teachers of potential STEM scholars cultivate self-efficacy in their students in a gender-sensitive manner (Zeldin, Britner, & Pajares, 2008). Additionally, instructors should use specific, gender-neutral language when presenting STEM theories and describing data (Rosser, 1993). Another technique schools have established is the use of course content and learning tools that conform to the learning styles of both female and male students (Marginson et al., 2013). Other educational institutions expose female students to engaging science experiences starting at a young age (Marginson et al., 2013). The American Association of University Women aims to create this type of engaging science experience with programs like Tech Trek – an interactive weeklong summer camp designed for middle school girls interested in technical careers ("Tech Trek," 2015).

While these strategies are useful, they may be irrelevant in the context of emerging markets like Ethiopia, where students may not always have access to intensive workshops, conferences, or higher education outside of their home countries. Moreover, some of these ideas (offered as best practices) may not have cultural relevance in non-Western societies. The notion of self-efficacy, for instance, is difficult to encourage and enact in Ethiopia and the United States in the same way because of the cultural focus of collectivism in the former and individualism in the latter (Hofstede, Hofstede, & Minkov,

1997). Thus, by contributing to the body of research in science and technology through the lens of Ethiopian education specifically, I hope to contribute to the scholarship that may support this country's educational development, while still being relevant to the arena of STEM education more broadly.

Research Questions for Study

These important historical and political dimensions of Ethiopian society help us examine the experiences of women in a relatively understudied sector of Ethiopian education: higher education. Using postcolonial feminist theory and a "Circles of Progression" (Jama et al., 2008) conceptual framework, I aim to answer the following central research question in this study: what factors help women persist in undergraduate science and technology majors at public universities in Ethiopia? In addition to the central research question, I also explored the following sub-questions:

1.) How do participants describe their everyday, lived experiences as women in science and technology?

2.) What aspects of campus life help women succeed in these disciplines?

3.) How do women seek out and find institutional and social support at the various stages of their education?

Theoretical and Conceptual Frameworks

Postcolonial feminist theory. Socially, the term "gender" connotes more than biological sex. Gender also includes the structural relationship of the sexes with micro-processes, institutions, the economy, and the nation in which people reside. Gender ideologies are important to understand because gendered attitudes influence outcomes in

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cultural, economic, and political arenas. Traditionally understood as a binary, gender shapes many dimensions of a person's existence, including the way one dresses, eats, works, and gains credibility in the eyes of peers (Cranny-Francis, Waring, Stavropoulos, & Kirkby, 2003). In most countries across the globe, power is asymmetrically distributed amongst genders because patriarchy—which is the belief that men are more valuable than women—is an entrenched ideology (Price, 2014; Stromquist, 2012). Because the expression of gender in most contexts favors the male over the female, gender often operates as a hierarchical mechanism through which people can be controlled and subjugated. Postcolonial feminist theory is one of many theoretical tools that can be utilized to interrogate gender.

Perhaps the most important text in the canon of postcolonial feminist literature is Chandra Talpade Mohanty's (1988) theoretical article "Under Western Eyes: Feminist Scholarship and Colonial Discourses." In this seminal text, Mohanty urges scholars to always situate and specify their analysis of feminist struggle within the culture, history, and epoch that a group of women live in. The undergirding principle of postcolonial feminist theory is that the female body is manipulated, abused, and undervalued. Women's bodies are often used for maintaining the wellbeing of men (Lewis & Mills, 2003) and are subjected to hyper-sexualization (Mjaaland, 2016; Nanda, 1995; Puri, 2002). Women's bodies are not treated with the same respect as men's bodies (Garuba, 2002; Katrak, 2006; Mjaaland, 2016). However, since there is not a singular definition of what exactly *Woman* is, the circumstances of women's oppressions cannot be singular. Moreover, patriarchy continues to be so subversive and pernicious because it intersects

with linguistic hegemony[1](Emberley, 1993; Lin & Martin, 2005; Wa Thiong'o, 1994; Wane, 2008), cultural hegemony[2] (Capobianco, 2007; Mohanty, 2013; Ntseane, 2011; F. Robinson, 2011; Sa'ar, 2005; A. M. White, 2011), and neoliberalism[3](Mohanty, 2013). When the experiences of oppressed women are homogenized in scholarship, moreover, this homogenized narrative tends to foreground the lived experiences of White women in the West. In her caution to resist this ethnocentric universalism, Mohanty explains:

> It is in the production of this 'third-world difference' that western feminisms appropriate and colonize the constitutive complexities which characterize the lives of women in these [poorer] countries. It is in this process of discursive homogenization and systemization of the oppression of women in the third world that power is exercised in much of recent feminist writing, and this power needs to be defined and named. (p. 63)

In addressing this power in methodology and analysis, Mohanty postulates that third world women's liberation will be achieved only when their cultural and sociological positioning are taken into consideration. When scholars neglect to do this, non-Western women are normed through Eurocentric assumptions, and thus:

> …not only are third-world women defined in a particular way prior to their entry into social relations, but since no connections are made between first and third-world power shifts, it reinforces the assumption that people in the third world just have not evolved to the extent that the west has. (p. 80).

For emerging researchers, Mohanty's warnings are pertinent because they remind us to actively de-center the experiences and epistemological privileges afforded to

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[1] The tendency to prioritize the language and linguistic traditions of an ethnic majority group.

[2] The propensity to exalt the culture, practices, and values of an ethnic majority group.

[3] A privileging of a free-market economy and the production of goods; a principle that impacts fiscal practices in public and private sector.

Western feminist scholars who foreground Western women's experience with patriarchy. Postcolonial feminist thought demands that all analyses be contextual, and that we acknowledge the impact of social class and ethnic identity on the oppression of women in a specific cultural context. Instead of embracing an ahistorical flattening of how women are oppressed, this theory urges us to resist a colonial discourse in how we define, code, and uphold the narratives about women in poor countries outside of North America, Australia, and Europe.

In Ethiopian society, gender is a fundamental social construct. Patriarchy is deeply embedded in Ethiopian culture and resistance against this type of oppression must be culturally responsive if it is going to be effective. In this work, postcolonial feminist theory is used as the primary theoretical framework because it allows us to consider the socio-cultural context of Ethiopian life.

With Mohanty's foundational work in mind, the intersection of neoliberalism with patriarchy is particularly important in this discussion. As an offshoot of traditional capitalism, neoliberalism is a school of economic thought. Neoliberal policies tend to privilege the rule of the market (free enterprise), reduce public expenditure on social services, and minimize government regulation of institutions (Martinez & Garcia, 1997). In economically developing nations such as Ethiopia, capitalism has shaped the struggle for gender equity. Scholars like Gordon (1996) and Charusheela and Zein-Elabdin (2003) would argue that fundamental feminist goals—political equality, autonomy over sexuality and reproductive behavior, and educational access—are compatible with capitalism. For instance, capitalism has disrupted patriarchy because it has lessened the stability of men's

property ownership and role as the heads of households (Gordon, 1996). Furthermore, a global capitalist market has allowed more women to engage in wage labor outside of the home. At the same time, women tend to be more heavily impacted by capitalist restructuring of national economies, as demonstrated by overexposure to toxins, unsafe water, and unequal pay (Gaard, 2014). The structural problems of capitalist economies are often resolved by anti-feminist civil authorities and religious leaders. Likewise, women are still disproportionally responsible with the task of care giving within the home (Brenner, 2003). Utilizing postcolonial feminist theory is vital, then, because it allows us to complicate the role of a neoliberal market economy in simultaneously liberating (Charusheela & Zein-Elabdin, 2003; Katrak, 2006) and further oppressing (Mohanty, 1988, 2003, 2006, 2013; Shain, 2013; Wilson, 2014) women from entrenched patriarchy. For women in poor countries, neoliberal practices in education can be both liberating and oppressive, and postcolonial feminism helps us examine that tension more critically.

Circles of progression: A heuristic for organizing literature. As higher education access expands across the world, the retention of students in undergraduate programs has become a growing concern. Over the past few decades, many higher education scholars have designed models of student retention including: Spady's sociological theory (1970), Tinto's integration theory (1975, 1987, 1988), Bean's psychological theory (1980; Bean & Metzner, 1985), and Museus' culturally engaging campus environments model (2014). While these models have numerous strengths, one of their limitations is their near exclusive focus on higher education institutions in the

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United States. Because the literature about retention in African higher education is sparse, the "circles of progression" model of retention (Jama et al., 2008) is timely. Designed as a model to describe retention for non-traditional students at South African universities, this heuristic includes four stages of progression:

1. *Pre-entry: socio-economic factors that shape primary and secondary education*

   The pre-entry stage of retention is defined by the socioeconomic factors that shape the experiences of students throughout their primary and secondary education. These factors include: the socio-economic status of the families they come from, the rigor of schools they attended, and familiarity with English (oftentimes the language of instruction in schools).

2. *Initial entry: psycho-social factors that shape early experiences in higher education*

   The initial entry stage of retention is defined by the psychosocial factors that shape students' first experiences in higher education. These factors include: social integration into the university environment, familiarity with academic culture in universities, access to accommodation, and availability of orientation programs.

3. *Teaching & learning experience: pedagogical factors in higher education*

   The teaching and learning stage of retention is defined by the pedagogical factors that shape classroom experience. These factors include students' exposure to the norms of an academic environment, financial stability, and a strong command of the language of instruction.

4. *Ongoing social & academic integration: socialization and mentoring factors*

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The ongoing social and academic integration stage of retention is defined by the conditions for socialization and mentoring. These factors include access to the proper equipment in upper-level courses and a network of peer and professional role models.

The components of this retention model are summarized in the diagram below.
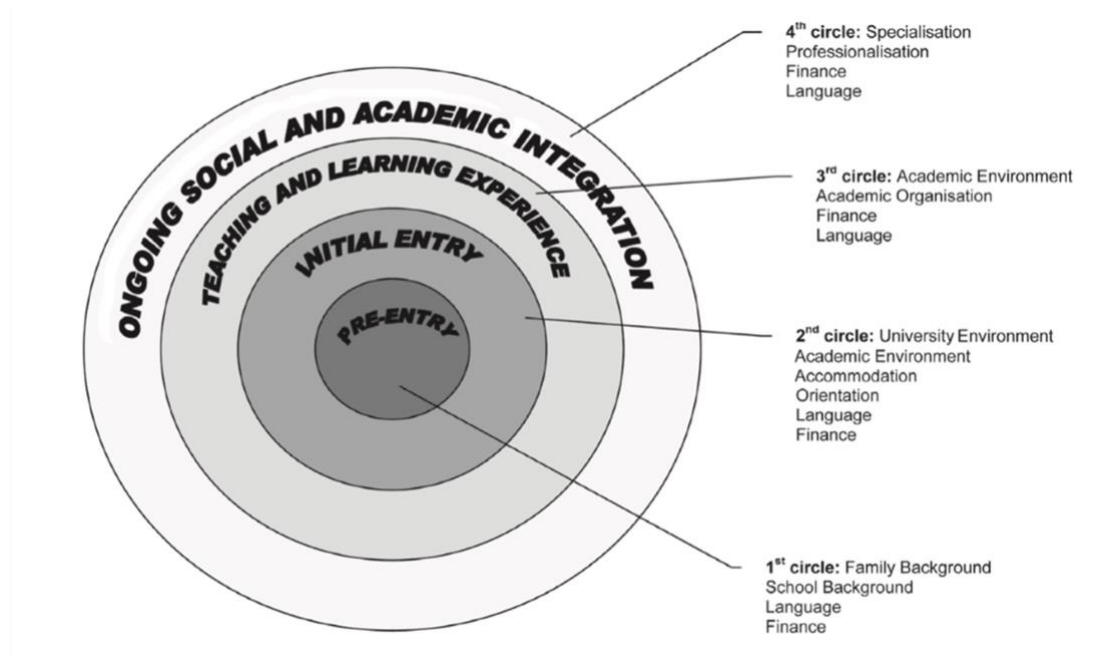
Figure 1. Original retention theory for non-traditional students: circles of progression. Taken directly from Jama et al. (2008) article.

While there are limitations of using a retention model designed for students in South Africa in a non-South African context, this model is helpful in framing the experiences of women in Ethiopian higher education because it reflects the experiences of a historically unrepresented student population in an African higher education setting. Moving forward, a modified version of this model is utilized as the organizing heuristic to explore the extant literature about women in Ethiopian education systems. In keeping with Mohanty's (1988) call for specificity in research methodology and analysis, Jama et

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al.'s 2008 model has been slightly amended to reflect the specific circumstances of

women in Ethiopian education, as shown in Figure 2.

Pre-Entry Stage: Socio-Economic
Factors that Shape Primary and Sec-
ondary Education
Family Background
School Background

Intitial-Entry Stage: Psycho-
social factors that shape
early experiences in Higher
Education
University Environemnt
Academic Environment
Acommodation
Orientation

TeachingStage & Learning
Experiences Stage:
Pedagogical Factors in
Higher Education
Academic Environment
Academic Organization
Language

Ongoing Social and Academic
Integration Stage: Socialization
abd Mentoring factors
Specialization
Professionalization
Finance

Figure 2 *Modified retention theory*
for Ethiopian women: circles of
progression
(Jama et al., 2008)

Figure 2. Modified retention theory for Ethiopian women: circles of progression (Jama et al., 2008)

In this modified model, the role of language is emphasized primarily in the third stage of

progression (Teaching and Learning Experiences), while the role of finance is

incorporated in the final stage of progression (Ongoing Social and Academic Integration).

In doing so, the literature about these two topics focuses on the stage of education where

they are most pertinent in the Ethiopian context. And while I have revised Jama and

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colleagues' "circles of progression" framework, the text from which this model came will be cited in the rest of this work to acknowledge the original source.

Lastly, it is important to acknowledge the limitations of the "circles of progression" model for student development in this study. The stages outlined by Jama et al. (2008) are predicated on a sequential and cumulative retention process. While it served as a helpful tool for sifting through the literature and for designing the interview protocol during the first phase of data collection, this four-stage model did not neatly capture the complex details of participants' lived experiences. Oftentimes, the four stages of retention overlapped in women's lives, so this heuristic could not be readily used to conceptualize the findings, recommendations, and implications of this study.

Addressing Gaps in the Literature: Implications for Further Study

Considering the many structural, social, and financial barriers that exist, it is truly remarkable when women successfully complete an undergraduate degree program in science and technology in Ethiopia. Since the overwhelming majority of literature and policy documents focus on what impedes women's success, there is a gap in the scholarship highlighting what will help women succeed. In exploring the factors that help women progress through the various stages of education, I hope to uncover knowledge about women's experience in Ethiopian higher education that will have implications for: 1) higher education theory, 2) higher education policy development and practice, and 3) strategies for linking Ethiopian higher education to an increasingly globalized market economy.

Contributions to higher education theory. In the realm of theory, further study of women's persistence in undergraduate science and technology programs in a country like Ethiopia would help scholars theorize student retention in a more nuanced and comparative way. Critical scholars recognize that the construction of scientific and technological knowledge is not universal, objective, or neutral. In both the academic and industrial sectors of science and technology fields, men dominate not only in numbers, but also in the construction of what is perceived as valuable knowledge (Pearson, Frehill, & McNeely, 2015). There is also evidence of sexism in hiring, funding, and publishing in science and technology subjects (Ceci & Williams, 2011). Throughout modern history, women's contributions to science have been devalued and rendered invisible (Pearson et al., 2015). Subsequently, many myths about women's ability have persisted across national contexts, and include the following misconceptions: 1) Academia is a fairly assessed meritocracy; 2) The issue of underrepresentation of women in science and technology will be solved naturally over time; and 3) Structural changes to help women succeed will diminish rigor and excellence (Tacsir, Grazzi, & Castillo, 2014). The science curriculum is particularly gendered because the clear majority of science textbooks neither address women's distinct experiences nor acknowledge women scientists (Pollack, 2013). Similarly, in academic spaces, the line between women's ascribed sexual identities and scientific identities are often blurred, making it difficult for women to be seen primarily as scientists or empirical investigators (Pollack, 2013). In doing this work, I attempted to disrupt the mythical notion that science and technology are objective disciplines—they are politicized, just like any other discipline (Ceci &

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Williams, 2011; Pearson et al., 2015; Pollack, 2013; Tacsir et al., 2014). By using Jama et al.'s (2008) model to organize this work, I extend the work done by U.S. scholars like Tinto (1975, 1987, 1988), Spady (1970), Bean (1980; Bean & Metzner, 1985), and Museus (2014); and demonstrate how persistence theories can change when applied to countries with emerging markets. Typically, racial identity tends to be an important factor that influences persistence in U.S. higher education (Camara, 2013; Fletcher & Tienda, 2010; Iacovino & James, 2016). In the case of Ethiopia, it is evident that gender, ethnicity, and rurality are intersecting factors that influence persistence, and should be explored more thoroughly.

Furthermore, this work helps us theorize about feminist consciousness in a country like Ethiopia. In the African context, feminist discourse is inextricably tied with anti-colonial liberation efforts, neoliberal economic reforms, and nation-building (A. M. White, 2011). In Ethiopia, women are usually excluded from political decision-making and civic life (Webster-Kogen, 2013). Despite recent gains for women, a women's movement has not emerged in Ethiopia the way it has in multiple other nations on the continent. Some scholars would go as far as arguing that a widespread feminist consciousness has yet to appear in Ethiopia (Biseswar, 2008). Broadly speaking, higher education has the potential to be an incubator for feminist consciousness within the country. The scholarship examined through this dissertation brings to the forefront the lived experiences of Ethiopian women and how they negotiate their intersecting identities within the context of a sexist system (higher education) and patriarchal society. Thus, it helps us explore new possibilities for a culturally responsive, feminist theory.

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Contributions to higher education policy and practice. In the realm of higher education policy and practice, further study of women's persistence in undergraduate science and technology programs would provide policy makers in Ethiopia with more insight regarding what is needed to support this population's success. To date, many policies have informed the current gender climate in Ethiopian higher education (see Appendix B). These include the Education and Training Policy Act (1994), the Education Sector Development Program Action Plan (2002), the Five-year Strategic Framework for Enhancing Women's Participation in Tertiary Education in Ethiopia (2004), and the Higher Education Proclamation No. 650, established in 2009. Affirmative action policies exist at the faculty level as well, so that women receive an advantage in recruitment (Molla & Gale, 2015). Generally, these educational policies focus on promoting equal access for students.

Despite widening access to higher education and implementation of gender-sensitive higher education policies, inequality in enrollment and in the persistence of women in education remains a problem. One of the main reasons these policies have not have been as successful as had been hoped is because they do not pay adequate attention to the structures and assumptions in higher education policies that contribute to maintaining the subordination of marginalized populations. As the extant literature demonstrates, the student populations most vulnerable to dropping out prematurely in Ethiopian higher education are those from geo-politically peripheral regions (like Oromo, Somali, and Gambella), women, students with disabilities, and students from lower socio-economic backgrounds (Abbink, 1997; Molla & Gale, 2015). When it comes to the

inclusion of women in higher education specifically, it is evident that the current policies fail to recognize how gender inequality goes beyond low enrollment of women. Moreover, these policies have also been largely ineffectual because they ignore the intersection of marginalized gender, class, and ethnic identities. For instance, women from rural, southern areas tend to be more jolted by male hostility on campus because compared with their peers from urban centers, rural female students are more disconnected from their cultural norms (Molla, 2013b; Molla & Cuthbert, 2014). The scope of this work then highlights ways to reimagine policy that would significantly and consistently support women's success in higher education broadly, as well as in science and technology disciplines specifically.

Uncovering what helps women persist in these disciplines would also be beneficial for developing policy that promotes sociopolitical stability in the country. Ethiopia is a socio-political bellwether because of its large population and its relative stability in the geopolitically volatile "Horn of Africa" – a region that frequently experiences intra-country and inter-country conflicts and wars (Tessema, 2009). In comparison to insular and unstable neighboring states (i.e., Eritrea, South Sudan, and Somalia), Ethiopia enjoys relative political stability and a steadily growing economy (Aalen, 2014). Within the past two years, however, widespread discontent with the current government regime has resulted in violent protests, a rise in civilian arrests, and the declaration of a six-month state of emergency (Chappell, 2016; Tegenu, 2016; Woldegiyorgis, 2016).

Considering this, women's persistence in higher education is an important component of democratization and peace building, because the current government regime relies on higher education to be both a driver of economic development and an instrument for curbing political insurgency (West, 2015). The continued underrepresentation of marginalized populations (ethnic minorities, students with disabilities, and women) poses a threat to the viability and efficacy of Ethiopian higher education. Furthermore, higher education institutions often act as the epicenters for political upheaval. A university can serve as both the incubator and the megaphone for sociopolitical discontent amongst the public (Shin, Kim, & Choi, 2014; B. White, 2015). By promoting equity and social justice for a minority group in education policy design, Ethiopia's Ministry of Education can ameliorate some of the populace's discontent with the current government. In strengthening higher education policies that support women, the Ethiopian government could successfully demonstrate that it is responsive to community needs and, in effect, committed to the social and political cohesion of the country.

Contributions to strategy development. Finally, this work has implications for how Ethiopian government leaders and stakeholders design domestic and international strategies for the country's development. Many economists view Africa as the final frontier for modern markets (Degbey & Ellis, 2017; Mensah & Alagidede, 2017; Silverstein, 2014). Domestic and international investments in African markets continue to increase, particularly in the manufacturing, natural resource extraction, and technology sectors. Additionally, bilateral trade relations with economic superpowers like China and

Germany, are also shifting the narrative of Africa from a helpless wasteland in need of Western aid to a rapidly growing and dynamic region of the world (Barnes, 2014; Galperin, Lituchy, & Punnett, 2017). Within this shifting narrative, Ethiopia plays a unique role as a country with one of the fastest growing economies on the continent (Cheru, 2016). While most scholars in the West still narrowly view Ethiopia as a poor country in need of aid, it is a nation with tremendous potential for economic and social growth. It has been and will continue to be an epicenter for economic development. Researchers from the Brookings Institute explain how Ethiopia is one of six African "lion economies" (a nod to the four "Asian Tigers," a nickname for the rapidly developed economies of South Korea, Taiwan, Hong Kong, and Singapore). Along with Nigeria, South Africa, Ghana, Kenya, and Mozambique, Ethiopia's economy has increased investments in human capital and promoted growth through expanding the labor market, what is largely an agrarian economy is shifting and becoming more modern (Golubski, 2016). While high unemployment, particularly among youth, remains an economic challenge, students with an undergraduate degree in science or technology are better equipped to benefit from the expanding economy.

Thus, the current economic circumstances in Ethiopia present an opportunity to create structural change that promotes the financial success of women (Charusheela & Zein-Elabdin, 2003). As the market for educated citizenry continues to expand, the full participation of women in the national and international market is needed for Ethiopia's competitiveness on a global scale. An investigation of women's persistence in undergraduate science and technology programs can unearth strategies for linking

Ethiopian higher education to an increasingly globalized market economy. Ultimately, this is important because across the globe, contemporary universities are viewed as "…a key driver in the knowledge economy and as a consequence higher education institutions have been encouraged to develop links with industry and business in a series of new venture partnerships" (Olssen & Peters, 2005, p. 313).

Per postcolonial feminist theory, this tendency to rationalize the wellbeing of women in order to promote the economy is problematic because it commodifies womanhood (Wilson, 2014) and does not value women's humanity for its own sake. At the same time, the allocation of financial resources and the development of education policies that support women are beneficial because they lead to the increased economic and social autonomy of this marginalized population. In Ethiopia, gender equity across the various stages of education (Jama et al., 2008) is both a byproduct and mechanism for neoliberalism (Boyd, 2016). While the relationship between a neoliberal, market-focused agenda and feminist decolonization is messy, it must be investigated. Ultimately, supporting women in this sphere of education is intimately tied to their liberation from patriarchal oppression. If and when women have full access and support at all levels of education, they will be able to add to Ethiopia's competitiveness as its leaders determine strategies for further growth.

Overview of Subsequent Sections

In the subsequent sections of this dissertation, I will provide six distinct chapters to answer the following central research question: what factors help women persist in undergraduate science and technology majors at public universities in Ethiopia? This first

chapter serves as an introduction to the study topic, as well as the theoretical and conceptual frameworks. In chapter 2, I present a survey of the literature, organizing the scholarship using a modified version of the retention model designed by Jama et al. (2008). In chapter 3, I explain my research methodology, study design, and participant profiles for all interviewees. In chapter 4, I offer a summary of my findings, including: the qualitative themes from interview coding, a synopsis of non-participant observations and document analysis, and an overview of quantitative survey responses. In chapter 5, I provide an overview of how study findings suggest changes in student affairs programming, course curricula and pedagogy, and university-access policies. In the sixth and final chapter of this work, I provide a theoretical discussion about the implications of this study for further exploration of gender equity in STEM higher education. To accomplish this, I show how this study highlights the possibilities and limitations of higher education as a tool for women's liberation.

Chapter 2: Literature Review

Circle 1: Pre-Entry – Girls in Primary and Secondary Education in Ethiopia

      Family background. The impact of family background on a girl's experience in the Pre-Entry stage (Jama et al., 2008) of education is profound. In Ethiopia, geography and widespread poverty shape the ways in which families support (or fail to support) a girl's education persistence. The World Bank estimates that the 81% of Ethiopia's 102 million people live in rural regions, and that 33% of the population lives in poverty (2015). While tremendous gains have been made by the Ethiopian government to diversify industries such as finance and technology, the vast majority of Ethiopian people still rely on farming as the their primary mode of income generation (Leary, 2015). Correspondingly, many families depend on female children to contribute to household income—either by assisting in agricultural production, or by maintaining the home (USAID, 2016). As a result, girls are often required to orient their lives and labor around the wellbeing of their family members, rather than their development as students.

      For a girl, the expected obligations to her family are evident in many ways. Gable (2013) estimates that the average Ethiopian girl spends 28 hours per week doing household chores—this is five times the number of hours a boy is usually required to spend. Such an imbalanced domestic work burden has a negative impact on school success because girls are more likely to arrive to school late, be tired, and have less time

to study than their male counterparts (Gable, 2013). In addition to working more hours per week than boys, girls often must assume the responsibilities of marriage and parenthood at an earlier age. For example, in the Amhara region of Ethiopia, the median marriage age for a girl is 15.1 years; this is despite the Ethiopian government raising the legal age for marriage to 18 years old in 2000 (Zekaria, 2011). Child marriage continues to be a common practice, despite federal mandates banning them, because regional laws (which promote the practice) in rural areas carry more cultural weight and relevance (Gage, 2013). The added incentive of a dowry payment (Mengistu, 2015), given to the girl's family, can also hasten marriage. Early marriage is a particularly harmful traditional practice because it inhibits a girl's educational potential and employment opportunities later on in life (Chuta & Morrow, 2015). Approximately 29% of out-of-school girls reported marriage as the primary reason for discontinuing their education, while 38% of Ethiopian girls under the age of 18 become mothers (Erulkar et al., 2010). Early pregnancy also has a negative impact on a girls' educational attainment and increases her chance of maternal mortality (Gable, 2013). The rurality of most Ethiopian girls means that they have fewer social networks than boys—this is further exacerbated by their decreased school attendance and greater domestic burden. Thus, girls tend to have fewer friends and limited social spaces for peer mentorship and friendship, leaving them more isolated and dependent on their families.

Ultimately, the plight of many girls in Ethiopian families reflects broader cultural norms and expectations for women in Ethiopian society. Historically, Ethiopia's culture has been hostile towards women (Kedir & Admasachew, 2010). For instance, there is a

widespread tolerance for violence committed against women at the peer-group and community level (Kedir & Admasachew, 2010). Additionally, gendered cultural expectations dictate that a woman is committed primarily to her family and home, and maybe be subjected to harmful traditional practices, like female genital mutilation (Burgess, 2013b). Up until the past few decades in Ethiopian society, women existed almost exclusively in the private sphere of the home (Webster-Kogen, 2013). In this context, the roles that many girls are expected play in their families is consistent with what women in general face: a position of suppression and mistreatment.

When the impact of family background on a girl's pre-entry educational attainment is examined through the lens of postcolonial feminist theory (Lewis & Mills, 2003), it is evident that the behavior of many families is an extension of a larger, patriarchal society that relegates women to servitude. The education (and wellbeing at large) of girls may not be a priority for many families. Girls are expected to care for their siblings, tend to crops, and ease the suffering of ailing parents. They are expected to be supportive, docile, and quickly grow into mothers who will support their own families. So, while many families may want to see the girls in the family grow into happy and healthy women, they are culturally conditioned to see the labor (and bodies of young girls) as primarily a tool for survival. Girls' hampered educational aspirations and potential, then, become collateral damage in this pursuit. In light of Jama et al.'s circles of progression (2008) framework, most girls' family backgrounds appears not to support their progression to the next circle of the education trajectory.

School background. The school background of many girls in the pre-entry stage (Jama et al., 2008) of education is marked by a steady decline in participation. The educational pipeline in Ethiopia has distinct stages: starting with pre-primary education, followed by primary, secondary, and finally tertiary (higher) education, as summarized in the diagram in Appendix 1 (Kelemu, 2013). At each stage of education, girls and women are subject to cultural and structural barriers that limit their access and success, especially in the science and technology disciplines.

Pre-primary education. The educational pipeline in starts with pre-primary education, for children ages 4-6. Pre-primary education includes kindergartens and "O" class programs. Most kindergarten facilities (approximately 90%) are operated by faith-based charities and other non-governmental organizations. As a result, these private organizations also have jurisdiction of the curriculum and administration. On the other hand, the "O" class programs, meanwhile, are operated by the Ministry of Education (MOE) and are designed for students who do not have access to kindergartens. Children in "O" class programs receive supplemental instruction from primary school teachers in their respective neighborhoods (Kelemu, 2013). Starting at this early stage, gender bias exists because teachers in kindergartens and "O" class programs tend to assign boys more intellectually engaging tasks than girls. Cultural messaging inside and outside of the classroom also reinforces low expectations for girls at this stage. For instance, children in newspapers and textbooks are often depicted according to gender stereotypes, with girls and women portrayed primarily as housewives (Camfield, 2011).

Primary education. Primary education is divided into two cycles: the 1st cycle, for grades 1-4, and the 2nd cycle, which includes grades 5-8 (Kelemu, 2013). At this stage in education, the gender gap between female and male students is close to zero, with a gender parity index (GPI) measure of 0.92 (Kelemu, 2013). The gender parity in primary education can largely be attributed to efforts made by the MOE to accomplish the United Nation's call for "Education for All," a campaign to improve comprehensive early childhood education across the globe (Singh, 2010). However, one tremendous barrier for total gender parity and high quality of girls' primary education may be the cultural perception of menstruation. Cultural taboos and practices about menstruation impede educational attainment, especially during the second cycle of primary education. Girls in rural parts of the Oromia province, for instance, are discouraged to leave the house after the onset of menses to avoid rape, forced marriage, and abduction. Many girls also stay home during menses (thereby missing valuable instruction days every month) because of the absence of separate latrines at school, lack of access to expensive sanitary pads, and to avoid ridicule from male schoolmates (M. Sommer, Ackatia-Armah, Connolly, & Smiles, 2015).

Secondary education. Like primary education, secondary education is divided into two cycles: the 1st cycle, for grades 9-10, and the 2nd cycle for grades 11-12. At the end of grade 10, all students are required to take the Ethiopian General Secondary Education Certification Examination. This metric is designed to measure students' achievement in general secondary education (1st cycle) and qualification for the next cycle of secondary school. Based on their performance on the Ethiopian General

Secondary Education Certification Examination, students are tracked into one of two programs for 11th and 12th grade: a pre-university preparatory program, or a Technical and Vocational Education and Training (TVET) program (Kelemu, 2013).

Students streamed into the pre-university preparatory program are assigned to broader academic disciplines like the natural sciences, engineering, social sciences, and business. Before matriculating at an institution of higher education, students in the pre-university track must also take the Ethiopian National Higher Education Entrance Examination, or NHEEE. Public higher education institutions then use students' NHEEE scores and their grades from the second cycle of education to determine who is granted admission (Semela, 2010). Students in the TVET program have the option of working towards diplomas for technical careers like hotel management and secretarial science (Semela, 2011a).

The gendered experiences of young women in secondary education emerge in a variety of ways. In terms of gender parity, the GPI for the first cycle of secondary education is 0.91 (which is lower than primary education) and drops down to 0.81 in the second cycle of secondary education (Kelemu, 2013). An important factor contributing to this decline is the limited availability of secondary schools in rural regions of the country. Unlike primary education, increasing the number of secondary schools has not been a priority in the United Nation's "Education for All" campaign (Singh, 2010). In Ethiopia, this has meant that girls living in rural regions either have to travel long distances from their homes to attend school (thereby increasing the likelihood of rape, forced marriage, and abduction during commutes) or pay for hostels while attending school far away from

their families (Chuta & Morrow, 2015; Woodhead, Ames, Vennam, Abebe, & Streuli, 2009). Additionally, women consistently score lower on both the General Secondary Education Certification Examination and on the NHEEE than their male counterparts (Mjaaland, 2016); this suggests that both of these standardized tests might have a gender bias that harms women. The young women who do persist to the second cycle of education are disproportionately tracked away from the university-preparatory coursework, and are overrepresented (51%) in TVET coursework (Semela, 2011a).

When looking at the school background through the lens of postcolonial feminist theory (Garuba, 2002; Katrak, 2006; Mjaaland, 2016), a young girl's body is inextricably linked to her hampered success in the education pipeline. Whether it is the fear of sexual assault, disciplinary tracking by gender, gender-biased standardized exams, or the gendered pedagogical responses to a girl's presence in the classroom; femaleness itself becomes a barrier for progression to the initial entry stage (Jama et al., 2008) of higher education.

Circle 2: Initial Entry – Experiences of Women During Transition to Higher Education

University environment. Once women enroll at a higher education institution in Ethiopia, they embark on what Jama et al. describe as the initial entry stage (2008) of education. A defining feature of this stage is the university environment. Comprised of both physical and social components, the university environment at public Ethiopian universities tends to discourage women from advancing to the next level of education.

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The material components of a campus, including artifacts and buildings, can impact a student's sense of belonging (Museus, 2014; Strayhorn, 2015). Women, who comprise only 28.6% of undergraduates at public universities in Ethiopia (Kelemu, 2013), are disadvantaged by the physical environment of these institutions. To date, there are 31 public universities in the country and these institutions enroll about 77% of all university students (D. Teferra, 2015). While older institutions like Addis Ababa University, Bahir Dar University, and Hawassa University tend to be well resourced and strategically located in urban centers, most public institutions are in rural regions and face a variety of infrastructural challenges. Limited access to electricity, municipal-level water resources, and overcrowded offices (Van Deuren, Kahsu, Mohammed, & Woldie, 2016) are common issues for public universities in rural areas. Moreover, the Ministry of Education (2011) acknowledges that gender-based violence on university campuses and the frequent absence of segregated latrines for women pose as major challenges for women, particularly during their first year.

Similarly, the social environment does not encourage the persistence of women in higher education. The inadequacy of social inclusivity for women is evidenced by the feeble institutional support of important gender offices. Each public university is required to have a gender office on campus. These offices are designed to make the campus environment more inclusive to women by: creating awareness about gender inequality issues, carrying out educational programming, connecting women to academic resources, and providing female students with counseling support as well as life-skills training (such as time management). More broadly, through the support they provide for students, the

individuals who work at gender offices help reshape campus traditions and influence the socialization processes for women. The offices also serve as conduits for collaboration with the surrounding community and external organizations (Mossissa, 2015). Despite the beneficial impact of these structures, gender offices are in dire need of organizational capacity building. The need for greater support is most keenly seen in the absence of paid staff members; gender offices tend to be staffed by volunteers, rather than paid university employees (Semela, 2007).

When examining the university environment through postcolonial feminist theory, we see a need for supporting marginalized groups with material resources (Katrak, 2006). For women in Ethiopia, it is imperative that institutional support of women's success in the initial entry of education must go beyond rhetoric and policy design. It must be evidenced in the tangible structures and social support systems for women entering college. As it stands, the university environment does not adequately assist women in successfully advancing through the education pipeline.

Academic environment. In the Initial Entry stage (Jama et al., 2008), women encounter a hostile academic environment. This is partially because a multitude of stereotypes threaten women's academic contributions and sense of belonging. In 2004, the Ministry of Education introduced the Five-Year Strategic Framework for Enhancing Women's Participation in Tertiary Education. A major part of this federal strategy was an affirmative action policy that lowered the minimum score on the Ethiopian National Higher Education Entrance Examination for women. This affirmative action policy is widely publicized, and because of this, there is a pervasive stereotype that women

enrolled at public universities do not rightfully earn their admission into these institutions. While the policy itself is designed to benefit women, the stigma attached to this affirmative action policy may hamper female students' academic self-concept and academic performance (Semela, 2007). Moreover, in science and technology, women's academic contributions are often devalued or entirely erased due to: a lack of academic support (tutoring, career counseling, etc.), pedagogy that reinforces gender stereotypes, and being afforded fewer opportunities for research and publications (Amazan, 2009; Molla & Cuthbert, 2014). These issues are intensified for female students from rural areas because the university environment tends to be in conflict with collectivist cultural values and norms that are common in indigenous communities (Andualem & Gebre-Egziabher, 2009).

Additionally, as mentioned before, sexual assault is a barrier to academic achievement in the initial entry stage (Jama et al., 2008) of higher education. In public universities, male professors frequently ask female students for sex in exchange for high grades (Bezabeh, 2016; Kvach et al., 2015). Male students also bully and sexually assault female students in libraries, lecture halls, and other academic spaces (Arnold, Gelaye, Goshu, Berhane, & Williams, 2008). Most frustratingly, these overt and subtle abuses against female students are frequently carried out with impunity. Women are oftentimes afraid of retaliation and stigmatization, and, thus, they underreport these issues to the appropriate university authorities (Molla & Cuthbert, 2014). Consequently, such sexual abuse goes unchallenged and unpunished.

From a postcolonial feminist lens, it is infuriating (but not surprising) that women can be disrespected, have their academic contributions invalidated, and be sexually assaulted without meaningful recourse. Nanda (1995) and Puri (2002) explain that women living in patriarchal societies must constantly negotiate the sexualization of their bodies with survival, even in ostensibly rational and egalitarian environments (like higher education institutions). In the academic environments of the initial entry stage, the abuse women face is not only common, but is also frequently attributed to women's lack of assertiveness (Molla, 2013b; Molla & Cuthbert, 2014; Worku, 2001). Overall, women are not socialized or encouraged to raise concerns and speak out against these injustices. It is therefore important to note that,

> [i]n the absence of pervasive legislative and policy regimes to address the problem within higher education institutions, the structural factors of inequality in higher education institutions function to implicate the real or presumed attributes of women themselves as the reason for their status (Molla & Cuthbert, 2014, p. 13).

Instead of receiving additional institutional support, women are often blamed for their own oppression. Thus, the hostility of academic environments plays a crucial role in impeding women's progression to the next stage of education.

Accommodation. University accommodation also plays a role in shaping the experiences of women in the initial entry stage (Jama et al., 2008). Most aspects of accommodation are determined and organized by the Ministry of Education. The Ministry subsidizes the cost of tuition, lodging, food, and healthcare for all full time public university students (Waweru, Abate, Huka, & Dawe, 2011). In addition, the Ministry also assigns what campus a university student attends and what they study

(Gebrehanna, Berhane, & Worku, 2014). Once enrolled, all students are required to live on campus with residence hall assignments grouped by departmental affiliation, and individual rooms assigned alphabetically by last name (Adamu, 2013). Beyond these initial parameters, requests for special accommodations are addressed according to perceived priority level, with the highest priority given to students with disabilities and women from rural regions of the country ("Housing and Dining," 2016). Since students at any given higher education institution come from all over the country (Gebremeskal, 2011), residence life at public institutions can be a platform for intergroup dialogue and inclusion. Theoretically, the organization of on campus accommodation allows people from different religious and ethnic backgrounds to come into contact with one another, and learn about each other's unique ethnic, class-based, and religious backgrounds (Adamu, 2013). The website of the division of Housing and Dining at Addis Ababa University, for instance, explicitly promotes intergroup dialogue and inclusion through campus housing by explaining, "there will be an attempt to mix students as much as possible to give them the opportunity of experiencing different cultures and approaches to life" (2016).

While on-campus living is common for female university students, it can be an exclusive and damaging experience for them, despite well-intentioned policies from the Ministry of Education. Women are often socialized to be close-knit with family members from a young age (Mabsout & Van Staveren, 2010; Woldemicael & Tenkorang, 2010), and because of this, the notion of a young woman moving away to college can be disruptive and isolating. Living on-campus also presents additional challenges with the

increased likelihood of sexual assault, the discomfort of overcrowded dormitories, and the financial burden of incidental costs (Seblework, 2004; Seife, 2007; Semela, 2006, 2007). The accommodation issues faced by women on campus are especially pertinent for rural students because they tend to enter higher education with lower socio-economic indicators (Woldemicael & Tenkorang, 2010). Similarly, the difficulties of on-campus accommodation are exacerbated for any female student placed at a university in a rural region of the country. Universities such as Mizan Tepi University (in the city of Mizan), Wachamo University (in Hossana), and Metu University (in Metu) tend to be newer and have poorer infrastructure than older, more established universities (West, 2015).

Through the lens of postcolonial feminism, it is evident that accommodation conditions at Ethiopian universities tend to disrupt the collective support systems in which women more comfortably exist (A. M. White, 2011). Generally, young women prefer to be embedded in their family structures to minimize sexual assault and to maintain emotional support systems (Ellsberg et al., 2015; Warren, 2010; Wessells, 2015). Thus, extracting oneself from this network to attend university (especially one located in a rural region) can lead to diminished success in higher education for women. So, while the government's policy of mandatory accommodation for university students has the potential for promoting success, it also poses multiple barriers for women's progression through the next stage of education.

Orientation. Orientation for new students is a milestone for women during the initial entry stage (Jama et al., 2008). This period of high-activity may be the students' first exposure to the university environment. For students at public universities, orientation programs are designed with a set of guiding principles that include a set of structured activities and promoting the socialization of new students into the institutional culture.

Student affairs professionals have a specific goal for orientation programs across institutions: to create a campus environment that encourages learning and minimizes anxiety ("Students Life," 2016). To achieve this overarching goal, orientation program managers adhere to the following guiding principles: the value of each student's personal safety, the benefits of on campus student services, and the necessity of students' social integration into the university community. Correspondingly, students are expected to abide by a code of conduct, which requires students to return borrowed property and materials, and seek out counseling services when they encounter personal or academic issues.

The activities offered to students during orientation are largely focused on logistics and information about on campus services ("Students Life," 2016). During this time, students participate in campus tours, engage with the faculty and support staff of their respective departments, and learn about clubs and volunteer opportunities. Students also receive information about the community surrounding the campus, such as places of worship, marketplaces, bus stops, and train schedules. Within the scope of orientation programming, special attention is paid to "…students with disabilities, foreign students,

female students, and students who need affirmative action" ("Students Life," 2016). While it is unclear what the scope of these additional activities are, they presumably involve providing these students with additional information and opportunity to ask questions about the institution.

Within the purview of postcolonial feminist theory (A. M. White, 2011), the impact of orientation programs may be considered both beneficial and problematic. Through orientation programs, women can be made aware of offices, university personnel, and university policies than can help them navigate patriarchal institutions. Access to the information presented during orientation empowers women, as well as helps them survive and succeed. At the same time, orientation programs may be problematic for female students because they place the burden of integration and inclusion on the student rather than the institution. For instance, when describing the protocol for seeking out counseling services, the staff at Addis Ababa University explain that disadvantaged students should "know that it is their responsibility to ask for assistance; however, the Counselor may refer a student at any time, if appropriate and necessary, to a higher service providing entity" ("Students Life," 2016). By asking women to do the emotional labor of fitting into a hostile environment, orientation programs may reify the same patriarchy that these programs were designed to mitigate. Therefore, orientation programs can both promote and inhibit women's progression in higher education.

Circle 3: Teaching and Learning Experiences

     Academic environment. In addition to the chronological progression of students, a fundamental part of their journey of persistence takes place within academic environments. He academic environment of teaching and learning (Jama et al., 2008) impacts the persistence of women in Ethiopian higher education. Science and technology disciplines are uniquely situated within this education system. In 2008, the Ministry of Education established a policy that requires 70% of all students enrolled in public universities to study science and technology; from amongst these individuals, 40% are expected to study natural and computational sciences exclusively (Kelemu, 2013). The Ministry's rationale for this requirement is based on the country's need for an educated workforce that will contribute to sustainable development. Additionally, the policy also comes as a response to pressures from the World Bank, an institution that promotes increased enrollments in science and technology studies for countries receiving loans (Girmaw Abebe Akalu, 2014; Molla, 2013a, 2014a; Salmi, 2015; WorldBank, 2014).

     Despite increasing pressures to produce science and technology professionals, the quality of science and technology education has been declining with the rapid expansion of higher education institutions (Semela, 2010). The academic environment for women in these disciplines may not be welcoming, as evidenced by their historically low participation in science and technology majors. Women make up 33.39% of public university students (Bekele, Winton, Wordofa, Amlaku, & Lemma, 2017). Based on estimates from the African Development Bank from nearly 15 years ago, women comprised only 11.5% of science majors and 7.2% of technology majors at public

institutions in Ethiopia (2004). Nearly a decade later, women have better representation within these disciplines, but remain underrepresented in education overall. Within full-time undergraduate programs, women make up:

- 28.13 % of engineering and technology majors

- 44.07% of natural and computational science majors

- 31.76% of medicine and health science majors, and

- 32.23% of agriculture and life science majors (Bekele et al., 2017).

Academic environments for women who study science and technology can be hostile for a variety of reasons. Pedagogically, science and technology professors (who are typically male), often enact a sexist pedagogy (Molla & Cuthbert, 2014) in which women's critical thinking skills and analytic capacities are undermined. Moreover, the student-to-professor relationship in classrooms tends to be very hierarchical, which makes it difficult for a woman to approach her instructor with concerns and questions about course material (Molla & Cuthbert, 2014). This hierarchical relationship is complicated by the increasingly common practice of hiring faculty members with minimal teaching experience. As the number of public institutions has continued to increase in recent years, the available pool of seasoned science and technology faculty has not kept pace (West, 2015). Professionally, women who study science and technology do not have access to adequate career counseling, mentorship, and career development in college (Molla, 2013b). Thus, they tend to drop out of the pipeline because they often do not feel motivated. Additionally, limited technology and resources in classrooms—such as intermittent internet, outdated textbooks, and dysfunctional lab

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equipment—also prevent women from reaching their full potential in science and technology spaces (Abdela & Pillay, 2014).

The issues prevalent in science and technology academic environments are highlighted in a pivotal study completed by Semela (2010). In this work, Semela explores the defining features of undergraduate physics classrooms at Hawassa University. He explains that while there is not a significant gender difference in student interest in physics, the entry of women "…into physics and other so called hard sciences such as chemistry has been effectively discouraged at the institutional level" (p. 327). Moreover, the individuals interviewed in his study cite the following as reasons for why they are not actively seeking an undergraduate physics degree: 1) poor training in mathematics and science in secondary education, 2) perceived lack of job opportunities for physics graduates, 3) the discipline seems too abstract and theoretical, 4) the dearth of hands-on laboratory experiences, and 5) difficulty comprehending subject matter when it is taught in English. While the themes from this study are specific to physics, the lessons learned can translate into other science and technology disciplines.

From the lens of postcolonial feminism, women's low participation and persistence in certain academic areas (such as science and technology), is a function of inherently oppressive structures. Ultimately, the academic environment is a function of the Ministry of Education's neoliberal policy agenda. Specifically, the Ministry's 70/30 policy presents superficial strategies outlining how to support women in science and technology (Kelemu, 2013). The policy foregrounds economic development as the main priority and utility of education, instead of promoting gender equity and inclusion. As

postcolonial feminist theorists would explain, this sort of policy fails to recognize the dignity of women, their inherent value, and their right to exist in any sphere they chose to be in (Shain, 2013). Without this type of critical awareness about why women should be supported in teaching and learning spaces, science and technology academic environments will continue to inhibit women's progression to the next stage of education.

 Academic organization. The academic organization of teaching and learning spaces also influences how well women progress to the next stage (Jama et al., 2008) of higher education. In the past three decades, massive expansion (frequently called "massification" in the literature) and surges in enrollment have played a pivotal role in shaping the academic organization of teaching and learning (Areaya, 2010; Saint, 2015). Between 1991 and 2007, the number of public universities grew from two to 22. From 2000 to 2010, higher education enrollment also exploded, rising from 34,000 to 309,000 students (Semela, 2011a). However, the rise in the number of institutions and soaring enrollment numbers has had a negative impact on the quality of teaching and learning, especially for women. Rapid expansion has contributed to the high dropout rate of women as a result of fewer resources, reduced academic social support, and fewer faculty and staff to help women adjust to a new university environment (Semela, 2006, 2007). Moreover, at the classroom and departmental levels, the academic organization of science and technology majors tends to be regimented and hierarchical. Women, who are starkly underrepresented in these disciplines, tend to be negatively affected by this inflexible structure and limited resources.

At the classroom level, course material is presented in a rigid way. Professors utilize what Freire (2000) would call the banking model of education because the transfer of knowledge is often unidirectional, with students acting as empty vessels that are filled up with science and technology content. In response, students are expected to demonstrate mastery of material in timed, written exams and laboratory experiments (Woldeamanuel, Atagana, & Engida, 2013). A student's grade in a class is determined largely by the outcome of these exams, and there tends to be few other assignments that are considered when faculty are calculating final grades (Desta, 2004; Tessema, 2009). Massification has also left many public institutions alarmingly understaffed (West, 2015). To address this, universities often hire faculty members from other countries, such as India, to fill this gap. While international faculty members are often well-credentialed, they do not always have a critical awareness of the local culture, customs, and gender dynamics (Semela, 2011b; Woldeyes & Sehoole, 2015), and this lack of knowledge has the potential to inhibit an inclusive pedagogy. Combined, these classroom-level elements of the teaching and learning environment are not conducive to the success of women.

At the departmental level, science and technology majors do not have flexibility in their coursework. Students are assigned one of the following majors prior to entering higher education: Biotechnology, Chemistry, Computational Science, Computer Science, Earth Sciences, Environmental Science, Food Science, Information Technology, Materials Science, Microbial Biology, Paleoanthropology, Physics, Plant Biology and Biodiversity Management, Sport Science and Zoological Sciences. Undergraduate degrees are typically awarded after three to four years of study and the doctor of

medicine (MD) and doctor of veterinary medicine (DVM) are both considered undergraduate programs (Kelemu, 2013). Students take courses almost exclusively in their assigned majors and do not have the opportunity for cross-disciplinary and interdisciplinary experiences. While requiring students to focus on classes for just their assigned major has merit, research suggests that interdisciplinary approaches in science and technology inquiry tends to support the progress of minority students (Bradforth et al., 2015; Fink, 2013; Rhoten & Pfirman, 2007). It is plausible that interdisciplinary course offerings could potentially increase women's persistence rates in these majors.

From the viewpoint of postcolonial feminist theory, a more collective and collaborative academic organization would likely enhance the persistence of women to the next stage of education. The massification of Ethiopian higher education reflects the increasing marketization of education in this region of Africa (A. T. Johnson & Hirt, 2011), which has the potential to further disadvantage women because there is a decline in resources for vulnerable populations. Women often engage in meaningful learning when they collaborate and solve problems with others (Capobianco, 2007; Ntseane, 2011). A collaborative learning environment is also more consistent with the collective nature of Ethiopian society (Levine, 1974). Thus, the current academic organization of science and technology majors—which privileges hierarchical instruction and inflexible course requirements—does not help women advance in the educational pipeline.

Language. Teaching and learning experiences (Jama et al., 2008) are also impacted by language. In order to more thoroughly understand the impact of language policies in higher education, a brief survey of nation-wide language policy development

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is necessary. When the federal constitution of Ethiopia was created in 1994, an amendment to the constitution allowed primary and secondary schools to deliver instruction in regional languages (frequently called "mother tongues"), in addition to Amharic (the official national language) and English. This effectively created a trilingual system of education, in which Amharic and English are both taught as subjects (Bogale, 2007). The recognition and usage of regional languages have been important because they may contribute to inter-ethnic group harmony and a sense of national cohesion. The recognition of indigenous languages in primary schools is especially important for ethno-linguistic minorities, such as the Afar, Somali, and Gambela peoples (Dessalegn, 2013) who rely on language to maintain their unique cultural heritage.

While the trilingual model of education has ideological and cultural merit, it can hamper the ability of many students to successfully progress in the education pipeline. Starting with the first cycle of secondary education (grades 9-10), English becomes the language of instruction for all classes, instead of just a subject. Many students, unfortunately, are not ready for this drastic transition because prior to secondary education, English is taught as a subject, and is usually learned, instead of mastered (Jha, 2013). Additionally, many schoolteachers (especially novice teachers) are often not proficient in the language and as a result, many students—particularly those from rural regions in peripheral parts of the country—are not adequately prepared for total English immersion. An example of this can be seen in many of the primary and secondary schools found in the Sidama region of southern Ethiopia. Teachers do not enforce the use of English in classrooms where "English as a Foreign Language" is taught as a subject

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(Mandefro, Mulatu, Abebe, & Yonna, 2016). Until recently, many colleges that specialize in teaching and education did not require that teachers in training take courses in the English language (Abebe, 2013). Consequently, as English formally becomes the modus operandi for education starting in ninth grade, students are oftentimes ill equipped to succeed in classrooms.

Thus, the impact of a trilingual (then monolingual) system of education is inhibitory. This can be particularly true for girls who live in rural regions of the country (where out-of-school exposure to English is even more limited than for urban residents). The transition to English as the exclusive language of instruction can thereby become a barrier for educational achievement in secondary education (Jha, 2013, 2016). As is the case in secondary education, the language of instruction in higher education is English. In addition to being used in the classroom, English is also used as the language of administration, so official university documents, university websites, faculty meeting minutes, departmental reports, and other items are all written in English. Despite the exclusive use of English, proficiency remains low among many students. Mastery of the language remains difficult because English education and training in secondary education is not rigorous, and because English language courses are typically not required for college students (Eshetie, 2010; Francisconi, 2012).

Additionally, there is a disconnect between the monolingual culture of university campuses and the otherwise multilingual nature of Ethiopian society. In the cities and towns of the Amhara region (like Addis Ababa, Bahir Dar, and Gondar), the regional language of Amharic is typically used in institutions like hospitals, places of worship, and

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supermarkets (Getachew & Derib, 2006; Lanza & Woldemariam, 2008). Similarly, in cities and towns of the Tigray region (like Mekelle, Adwa, and Axum), the Tigrayan language is used, while Oromifa is spoken in the Oromo regions of the country (Habtu, 2004; Salawu & Aseres, 2015). Considering this sociocultural context, linguistic immersion becomes a problem for students in higher education. Linguistically, what is expected of students in the classroom may not be consistent with their lived experiences outside the university. For women, the use of language in classrooms and administration in the initial entry stage is even more troubling because they are statistically more likely to experience added anxiety about English language acquisition than men (Gerencheal & Horwitz, 2016).

When looking at the impact of language in Ethiopian schooling through the perspective of postcolonial feminist theory, a peculiar ideological contradiction emerges. Ethiopia is the only African country that has never been colonized. Ethiopian armies successfully resisted Italian invasions two times, once in 1896 and again in 1936 (Milkias, 2013; Nicolle, 2012). For many Ethiopians at home and in the diaspora, this resistance to colonialism is cause for tremendous pride in Ethiopian heritage. Some would argue that the victory over European colonialism is a fundamental part of modern Ethiopian identity.

The contradiction emerges when the anti-colonial heritage of Ethiopian culture is juxtaposed against the use of a Western (and therefore, colonial) language in Ethiopian schooling. Language, and the practice and preservation of indigenous languages, is a hallmark of postcolonial thought (Lin & Martin, 2005; Wa Thiong'o, 1994). It is peculiar

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then, that in a country where many people bristle at colonialism, that most education institutions operate (at least in policy, if not in practice) exclusively in English. Like many other structural elements of Ethiopian education, the language policy does not wholly support the progression of girls and women to the next stage of education.

In terms of teaching and learning experiences, the use of the English language hampers the quality of education women receive at this stage of higher education. Statistically, women are more likely to have their academic performance hindered by the use of English as the language of instruction (Gerencheal & Horwitz, 2016). Through the lens of postcolonial feminist theory, the linguistic challenges faced by women in higher education would be understood through cultural hegemony (Mohanty, 2013). The utilization of English instead of native languages, perpetuates the dominance of English-speaking cultures and Western epistemologies. In keeping with scholars who recognize that the decolonization of language is a part of women's liberation (Wane, 2008), the use of non-indigenous languages do not benefit women as they progress through this stage of education. When local languages are discarded in higher education, the agency and cultural capital bound up in those languages are also lost. Women are even more vulnerable to cultural silencing than men because of their marginalized status in patriarchal Ethiopian society, therefore, current language policies in the initial entry stage of education do not promote educational persistence. Consequently, using English as the language of teaching and learning environments often impedes the progression of women to the next level of education.

Circle 4: Ongoing Social and Academic Integration

Specialization. As undergraduate students approach the completion of their degree programs, opportunities for specialized academic training are an important part of their progression (Jama et al., 2008) through education. This specialization can be offered through: 1) science and technology institutes at individual universities, 2) the lab experiences afforded by upper level courses, and 3) partnerships that a public university forms with external funding agencies and foreign universities.

Amongst external partners, the United States Agency for International Development (USAID), the World Bank, and the MasterCard Foundation, stand out and are particularly important in shaping specialization experiences. In 2013, USAID and the National Science Foundation (NSF) collaborated to fund a research project that was jointly administered through Addis Ababa University and the University of Oklahoma. Researchers from both universities were involved in developing an aluminum oxide tool that removes fluoride from water in the Ethiopian Rift Valley (USAID, 2013). In another major funded endeavor, the World Bank provided 24 million dollars to the Ethiopian government for a project titled the "Eastern and Southern Africa Higher Education Centers of Excellence Project." Funds were allocated to provide upper-level higher education students with the research skills and experiences in high-priority sectors such as the agriculture and health sectors. Through this work, the World Bank hopes to curate African Centers of Excellence in universities in order to stimulate regional economies (Woodeneh, 2016). Lastly, the MasterCard Foundation has partnered with the International Center of Insect Physiology and Ecology (ICIPE) to commit 10.35 million

dollars to assist young people (ages 18-24 years old) secure gainful employment. This project is targeted towards youth who have scientific and technological expertise with regards to the beeswax, honey, and silk industries, which are natural resources in Ethiopia (Moses, 2016).

While the opportunities for specialization can be vast (especially in the context of multimillion investments from external funding agencies), an Ethiopian's student's ability to take advantage of these offerings are predicated on whether they persist in their studies. For women at public universities, the educational pipeline is "leaky," so most will not be able to acquire the valuable research skills offered through USAID, the World Bank, the MasterCard Foundation, and other similar institutions.

From a postcolonial feminist perspective, this inequitable allocation of opportunities is a function of patriarchy (Mohanty, 1988). In keeping with the broader pattern of Ethiopian society, the bulk of financial resources and professional networks are reserved for men, who hold the most power and access to social capital. To disrupt this oppression in education, opportunities for specialization (and the material benefits that come from it), must be offered to both women and men. Until that happens, specialization will continue to be an aspect of teaching and learning experiences that hinders the progression of women to the next stage (Jama et al., 2008) of education.

Professionalization. Opportunities for professional development for women in science and technology majors are limited (Jama et al., 2008). In the context of Ethiopian education, professionalism can involve mentorship from more advanced students and faculty, access to a network of professional employees, and career planning. Since

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women are a minority group in science and technology, female students particularly benefit from professional support that is facilitated by other women (Hill, Corbett, & St. Rose, 2010; Noe, 1988; Thomas, Bystydzienski, & Desai, 2015). However, there is a dearth of this kind of interaction because the proportion of female participation decreases as the level of education increases. Across disciplines, only 11.5% of Master's degree students are women, while 8% of PhD students are female (Semela, 2011a). Meanwhile, only 10% of faculty are women, and approximately 6% of academic staff at Ethiopian institutions are women (D. Teferra & Altbachl, 2004). In science and technology specifically, limited time for parental leave and child rearing responsibilities make it markedly difficult for women to advance in academia (Molla & Cuthbert, 2014). Without institutional support for writing scientific publications and fulfilling the research requirements for doctoral degrees, a woman's likelihood of gaining professorships and/or senior administrative positions are effectively diminished (Molla & Cuthbert, 2014).

Recognizing these disparities, both institutional and external stakeholders have attempted to enhance prospects targeted at improving professional development opportunities for women. In 2012, twenty-six female students from Addis Ababa University collaborated with staff at the Center for Creative Leadership (a private consulting company), to create "Social Innovation Mentoring," a club for undergraduate students. In this small, on-campus organization, women meet weekly over lunch to develop their skills in public speaking, creativity, and leadership. This club also gives participants the opportunity to volunteer, engage in professional development trainings, and attend in leadership retreats (Asmare, 2013). On a larger scale, USAID supported

over 1,000 first year female university students as they engaged in a large-scale

mentorship program during the 2014-2015 academic year. In this program, second and

third year university students mentored first year students by providing advice about

academic life, English language acquisition, and life skills training (USAID, 2016). In

both examples, it is evident that women value and need this type of mentorship from

other women.

Through the lens of postcolonial feminist theory, the limited opportunities

available in improving professionalism practices for women, and the way women forge

those opportunities for themselves, are both consistent with the notion of resistance

against hegemony (Sa'ar, 2005). These women have a shared epistemology that comes

out of their shared oppression, and as a result, they can support one another in a unique

way. When women rely on each other by engaging in peer-to-peer and protégé-to-mentor

relationship, they are enacting a feminist ethic of care (F. Robinson, 2011), and are also

helping one another progress to the next stage (Jama et al., 2008) of education.

Finance. When considering ongoing academic and social integration, women's

financial responsibilities potentially deter educational success in this final stage (Jama et

al., 2008) of education. Historically, public higher education has been entirely subsidized

by the federal government. Under this financial scheme, all expenses associated with

enrollment—including food, accommodation, and basic healthcare—were paid for. In

2003, the Ministry of Education implemented a cost sharing mechanism known as the

"Higher Education Cost-Sharing Council of Ministers Regulation." Through this policy,

all students enrolled at public universities would be required to financially contribute to

their education through a graduate tax. This tax is levied on a university graduate within six months of graduation and requires that an individual pay 10% of their monthly income to the MOE for up to 15 years. Students who were enrolled in teacher education programs (which make up about 35% of all public university students), are exempt from this graduate tax if they teach in government primary and secondary schools after graduating (Ayalew, 2013). Heavily promoted by the World Bank, this cost sharing policy was created to increase much needed revenue for the government as the higher education system continues to rapidly expand (Molla, 2014a, 2014b).

Although the cost sharing policy was introduced more than a decade ago, and there are still many challenges still exist with regards to its implementation and success. For many students, the prospect of graduate tax is a barrier for persistence because the amount of withheld income is too high. Students are also frustrated by the fact that they are expected to contribute financially as consumers of education but are not given the flexibility of choice (in what they study, what campus they are assigned to, and if they live on campus, etc.). The paradox of limited choice and mandatory cost is a cause of ire for students. To this point, Ayalew (2013) explains "…it is virtually impossible to turn students into customers and to introduce market values in institution; in the market-place, both providers and consumers should have free choice based on available information to make a rational decision" (p. 115). Additionally, rising inflation (Bekana, 2016) in the country adds to students' incidental costs, such as photocopying articles for class, toiletries, and transportation expenses during breaks. For female students, the cost sharing mechanism may be an even more significant barrier for persistence because women tend

to be academically tracked into less lucrative disciplines than their male counterparts (Semela, 2010). Thus, women generally have a smaller financial safety net to fall back on, even after they finish their undergraduate education.

Additionally, women enrolled at public higher education institutions are also disproportionately affected by financial policies because of the out-of-pocket expenses they are responsible for. In the broadest sense, all students need money to cover the cost of instructional expenses that are not subsidized by the Ministry of Education. Items such as textbooks, writing supplies, and laptops are purchased out-of-pocket. Depending on the cost of living of the city or town where a particular university is based, these instructional expenses can cost between 521-1,040 birr (the equivalent of $227-$452) per year (Johnstone, 2009). Considering that the annual per capita income for Ethiopia is $590 (Toure, 2016a), this out of pocket expenditure is a tremendous financial burden for women pursuing an undergraduate degree. To cover these costs, students may rely on personal savings, contributions for family members, and earnings from on campus work. Depending on how pressing financial constraint may be, some undergraduate women also turn to prostitution as a method of income generation (Abebe, 2013). Since prostitution increases the risk of sexual assault, unwanted pregnancy, and venereal disease (Mooney et al., 2013), female students who engage in this practice encounter additional barriers to their educational attainment.

In addition to basic instructional expenses, students enrolled in science and technology majors must also cover the cost of specialized supplies such as, statistical software, laboratory goggles, and laboratory notebooks. These supplies are generally

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imported, and as such, they tend to have a higher-mark up price than other supplies (Gebre-Mariam, Tahir, & Gebre-Amanuel, 2016). Moreover, science and technology majors are often asked to pay an additional fee to receive academic support from faculty and staff. At Addis Ababa University, for instance, the Institute of Technology generates the greatest proportion of internal revenue for the institution (4%) through fees charged for consulting services (Tadesse, 2016).

Cumulatively, the additional cost incurred by science and technology students has a greater impact on the educational success of women. Literature from the learning sciences shows that women tend to benefit from hands-on laboratory exercises because it facilitates inquiry based instruction (Marginson et al., 2013). Inquiry based instruction is enacted when students are expected to: engage with broad scientific questions, evaluate evidence and artifacts to answer broad questions, compare alternative explanations, and communicate their findings to peers (Crippen & Archambault, 2012). In Ethiopian education, laboratory experiences are necessary for the success of all students, and especially academically disadvantaged students. Women are more inclined to enter science and technology disciplines with a greater academic disadvantage, and laboratories can be a platform for robust and dynamic learning. The prohibitive cost of learning and laboratory materials, then, becomes not just a logistical inconvenience, but it also poses a meaningful barrier to academic persistence in higher education.

From a postcolonial feminist perspective, both the cost-sharing program and the cost of out-of-pocket expenses are detrimental for the well-being of women in Ethiopian education because of its neoliberal emphasis. Postcolonial feminist scholars like Mohanty

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(2003, 2006, 2013) would argue that foregrounding market-priorities in policy design ultimately hurts women that live at the intersection of gender and economic marginalization. Neoliberal policies tend to maintain economic stratification and ignore the circumstances and needs of the most vulnerable populations. Consequently, when policies like the cost sharing mechanism make higher education an increasingly privatized good, the progression of women to the next stage of education is hampered. Additionally, the prohibitive costs of higher education are oppressive and must be interrogated. In most societies, women's labor and bodies are exploited and taken for granted (Katrak, 2006; Mohanty, 2013). In many ways, Ethiopian society benefits from, and is fortified by the uncompensated and/or undercompensated labor of women. From the disproportionate share of domestic work done by women, to the sex work that impoverished female college students are forced into, the labor of women is voraciously consumed. When such labor is juxtaposed against the financial barriers of teaching and learning, it is evident that the allocation of financial resources in higher education is not equitable. Since women tend to be more significantly impacted by the costs of teaching and learning, they deserve greater institutional support to ensure their success in higher education.

Chapter 3: Methodology

Summary of Methodology

In this study, I utilized Jama et al.'s (2008) framework to structure the data collection and analysis. The central research question guiding the study was: what factors help women persist in undergraduate science and technology majors at public universities in Ethiopia? A mixed methodological approach was ideal for this study because it allowed me to gain a more comprehensive understanding of how and why women are succeeding in the face of numerous barriers. In addition to the central research question, I also explored the following sub-questions:

1.) How do participants describe their everyday, lived experiences as women in science and technology?

2.) What aspects of campus life help women succeed in these disciplines?

3.) How do women seek out and find institutional and social support at the various stages of their education?

In keeping with the model from Jama et al. (2008), these questions focus on four broad dimensions of women's educational experience, including: 1) the experiences of girls and young women in primary and secondary education, 2) the experiences of women during the transition to higher education, 3) the teaching and learning

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environments in higher education, and 4) the ongoing social and academic integration in higher education.

In the remaining sections of this chapter, I provide a rationale for utilizing an exploratory mixed methods research design, a statement of researcher positionality, and a diagram that summarizes the research design. Furthermore, information pertaining to participation selection and recruitment strategies, a description of research sites, participant profiles, composite narrative based on interviewees, a summary of the data collection and analysis process, and an assessment of the credibility of gathered data are included. I conclude this chapter with a discussion of ethical considerations, reflections of the limitations of the study, and a list of appendices that contain recruitment materials, interview protocols, consent forms, and a transcriptionist confidentiality statement.

Rationale for Exploratory Mixed Methods Research Design

A mixed methods study is a valuable tool of inquiry for complex research problems. This category of study design combines both qualitative and quantitative approaches, so a researcher must carefully consider how data is collected, the timing of data collection, and how cohesively the information fits together. While there are a variety of mixed methods designs available (including convergent parallel, explanatory, exploratory sequential, embedded, transformative, or multiphase designs), the ultimate goal of a mixed method approach is to corroborate different data sources, and achieve breadth and depth of understanding (Creswell & Clark, 2007; R. B. Johnson, Onwuegbuzie, & Turner, 2007). In order to successfully complete a mixed methods study, an investigator must not only collect and analyze both types of data, but must also

successfully integrate the findings from the quantitative and qualitative portions

(Tashakkori & Creswell, 2007). Moreover, the findings from a well-developed mixed

methods study can often be applied to other settings, so these types of studies have a high

inference transferability (Tashakkori & Teddlie, 2010).

After considering the various types of mixed methods designs, I decided that an

exploratory sequential approach fittingly addresses the central research question. First,

qualitative data was collected (in the form of participant interviews) and analyzed. Then,

a quantitative data collection instrument (a survey) was designed using results garnered

from the qualitative data. The quantitative instrument was distributed and the collected

data analyzed. Since this is an exploratory approach, the integration of the two data

strands took place in the design phase of the study (Fetters, Curry, & Creswell, 2013;

Ivankova, Creswell, & Stick, 2006). Using Morse's (1991, 2003) notation for exploratory

sequential designs, this study can be written as **QUAL → quan**, with the capital letters of

the qualitative strand indicating its priority status.

Research Design

Figure 3. Visual Representation of Research Design
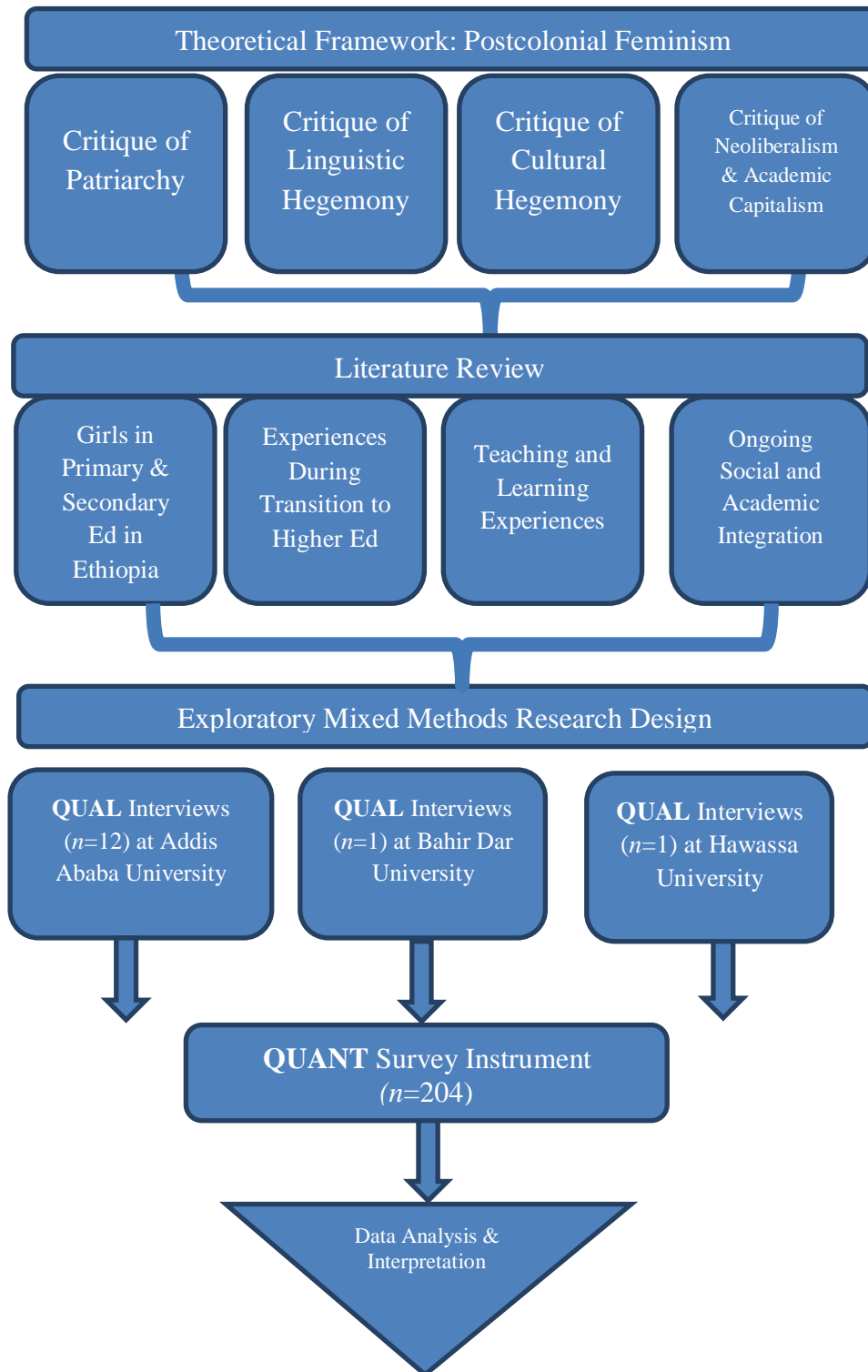
Dissertation Setting

This dissertation study took place in Ethiopia. While it is impossible to provide an extensive description of Ethiopian history and its current geopolitical economy in this dissertation, I will highlight a few dimensions of the country's history and culture that are pertinent to the analysis of study findings. This type of historicizing is important because education in Ethiopia has been deeply influenced by civic institutions, families, and religious institutions (Negash, 2006). Accordingly, I contextualize the evolution of the education system through the framing of three recent governance eras: the imperial period, which spanned 1855-1974; the socialist period, from 1974-1991 (Zewde, 2001); and the federal period, from 1991-present day (Clapham, 2018).

A defining feature of Ethiopian life under imperial rule was the production and maintenance of elitism. Prominent political leaders during this time included Emperor Tewodros II, Emperor Yohannes IV, Emperor Menelik II, and King Abba Jifar II (Zewde, 2001). The most (in)famous leader of this time is Emperor Haile Selassie I, whose reign was marked by political centralization and a commitment to education as an instrument for progress (Gemeda, 2002; Negash, 2006). During this time, women were relegated mostly to the private sphere (Kedir & Admasachew, 2010). The exception to this rule was the women of the ruling class. For example, Empress Menen Asfaw, Haile Selassie's wife, established a ruling school for the female children of aristocrats. Empress Menen Girls' School, established in 1931, was only accessible to families who had forged a relationship to the royal family of Haile Selassie. Similarly, the first established university, Haile Selassie I University, was the namesake of the country's last emperor

and oftentimes accessible to the elite members of his network (Semela, Bekele, & Abraham, 2017). UNESCO estimates that during 1961-1962, less than 7% of students enrolled in this university were female (1966). This selective access to education shows the prominence of gender and class identity, and this continues to be salient in the years following imperial rule.

A common trope in Ethiopian culture is the notion of exceptionalism. Historically, this trope gained eminence during the imperial era. This cultural phenomenon is due, in part, to the geography of the country—the expansive Semien Mountains in the north have made the nation somewhat impenetrable to external invaders (Egziabher, 1988). Religiously, this Christian-majority country is distinct from primarily Muslim neighbors, such as Somalia and Sudan.[4] Beyond this, the 1896 victory at the city of Adwa (in which 14,000 Italian soldiers were defeated during their attempt at invasion), is an important element of Ethiopian exceptionalism. In response to this military defeat, Western thought leaders normalized a discourse of individuality in order to reconcile this defeat of a White nation state by a Black army. Tibebu (1996) explains how:

> A new image of Ethiopia and Ethiopians, an image in tune with Western racist imperialisms of the times, had to be worked out. The easiest way to do so was to paint Ethiopians White. So was born the myth of Ethiopians as 'Black Caucasians' (p. 419)

In a broader epistemological discussion, many Ethiopians have internalized this discourse and often see themselves as exceptionally un-African. The cultural tendency to see

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[4] To this day, religion—particularly Orthodox Christianity—continues to be a major part of Ethiopian society (Abbink, 1998; Ahmed, 2006), and has a spillover impact on education. For example, members of the Orthodox clergy often run early childhood education centers (Hoot, Szente, & Mebratu, 2004).

themselves as exceptional may prevent critical analyses of power. Italian invasions and European attempts at colonizing Ethiopia have wreaked havoc on multiple aspects of civil society in this country, including education. Despite the myth of the Black Caucasians, Ethiopia is not the White-washed exception to the trend of Euro-American plunder of African people. It has been subjected to similar epistemic violence as other Black African countries, and must see itself in existence with, and in the same historical moment as other formerly colonized nations. Grand notions of Ethiopian empire have not protected this country from the structural and psychological impacts of colonialism.

When the socialist government came into power in 1974, there was major decentralization of education systems. Political leaders, like Colonel Mengistu Haile Mariam, dismissed the imperial system of education governance, and co-opted the education and professional trajectories of teachers. One of the unintended consequences of this type of governance is a widespread loss of prestige of the teaching profession (Negash, 2006). The prestige of teaching lost during the socialist era has not been fully-recovered to this day, as demonstrated by how few high-performing university students have a desire to become primary and secondary school teachers (Gardner, 2017b). The transition from an imperial monarchy to a socialist government in 1974 was also an important landmark for the development of both higher education and gender roles in this nation (Burgess, 2013b; Saint, 2004). The new government intensified government surveillance of higher education—mandatory courses on Marxism, elimination of student organizations, and repression of political dissent became common (Saint, 2004). Simultaneously, under this Marxist-Leninist regime of former Colonel Mengistu Haile

Mariam, women were expected to be active members of the state by participating in entities like the Revolutionary Ethiopia Women's Association, or REWA (Bahru, 1991; Burgess, 2013b; Zewde, 2001). Through REWA, nearly five million women had increased access to adult primary education and vocational training (Burgess, 2013b). In addition to REWA, the student movement in the 1970s was also characterized by women's activism (Biseswar, 2008).

Socialist government leaders blamed imperial rule for causing poverty in Ethiopia (Negash, 2006). In response to this, Socialist leaders incorporated Marxist-Leninist ideologies into education governance, which had a focus on the importance of science and technology curriculum (Bishaw & Lasser, 2012). The end of the Cold War and the rise of liberalism also influenced this government's understanding of the role of the market in solving social problems. The work of economist Theodore Schultz (1961), whose empirical work shows the direct association between education and increase in income in the United States, was especially important in shaping education policies during this time. Despite these valiant efforts, radical socialism has largely failed Ethiopia, and education has not been effective in alleviating poverty (Negash, 2006).

The defining feature of the current ruling party, the Ethiopian People's Revolutionary Democratic Front (EPRDF), has been its authoritarian, top-down approach to governance. Since this party came into power in 1991, the country has experienced massive urban growth, both in population and infrastructure. Gardner (2017a) notes how the current rate of urbanization in Ethiopia is now between four and six percent. Demographers estimate that the population of Addis Ababa alone will double to more

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than eight million people over the next decade. The expansion of the capital city into the farmland of people living in the Oromia region is one of the underlying causes for country-wide protests that took place in the fall of 2016 (Kestler-D'Amours, 2018; Tura, 2018). This, coupled with already brewing tensions between EPRDF and large swaths of this area, have culminated into the government declaring a nation-wide state of emergency two times in the last two years. The first state of emergency was in effect from October 2016 to August 2017, and the second from February 2018 to the present day (Horne, 2017; Schemm, 2018). Moreover, the rapid growth in population and infrastructure has implications for higher education because the federal government is turning its attention to smaller cities for sites of urbanization. Smaller urban cities like Hawassa, Bahir Dar, and Mekelle are being further developed to redirect some of the rural-urban migration to Addis Ababa (Gardner, 2017a, 2017b).

Personal Connection to Dissertation Setting

I completed this dissertation research while living in Ethiopia. After receiving the Fulbright-Hays Doctoral Dissertation Abroad fellowship, I moved from the U.S. to Ethiopia in March 2017 for a year-long stay. Originally, my plan was to travel and collect data from institutions in different parts of the country. Due to anti-government protests happening in those regions (frequently on university campuses), I was advised to stay in the capital city, where there is strong federal police presence and security.

As a member of the Ethiopian diaspora who has traveled to Ethiopia many times before (both for research trips and leisure), I have a sizable social and professional network in this country. Accordingly, I leveraged this network to help me accomplish my

research goals for this dissertation study. For instance, I met two out of the fourteen interviewees (Sewit and Yeshi) through mutual friends we have in the city. Meanwhile, I recruited three other interviewees (Bisserat, Netsi, and Tiya) through a colleague of mine who worked at the Center for Creative Leadership (a consulting company that works with university students). The most important research contacts I had, however, were two professors at Hawassa University (Dr. Tesfaye Semela) and Addis Ababa University (Dr. Berhanu Assefa). Both faculty members graciously introduced me to student affairs professionals on higher education campuses in Addis Ababa that helped me recruit students.

In terms of research timeline, I interviewed participants from March-June, 2017. Next, I analyzed the qualitative data and designed the emergent survey from July-November, 2017. I launched the quantitative survey in late November and closed the instrument in January 2018. Collecting data primarily in Ethiopia provided me with greater context about the lives of the people I am studying.

Qualitative Methodology

Qualitative research is used to unearth the lived experiences of individual people. Typically, "qualitative data provide depth and detail through direct quotation and careful description of program situations, events, people, interactions, and observed behaviors" (Patton, 1987, p. 9). Epistemologically, I value qualitative research because I believe knowledge is acquired primarily through the subjective, lived experiences of persons. In this work, I interacted closely with study participants. Additionally, I relied on their individual views and experiences as women to reach conclusions regarding Ethiopian

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higher education. The value of their subjective experiences is immense and as such, direct quotes have been utilized during the subsequent analysis (Fetters et al., 2013). In addition to this epistemological assumption, my feminist interpretative framework is an important component of the qualitative inquiry. Using a postcolonial feminist framework (Mohanty, 1988), I understand that the study participants live in a patriarchal society that marginalizes them. In response to this, I have engaged in research that will hopefully enhance gender equity in education, and ultimately, contribute to the empowerment of women in Ethiopian society at large.

Phenomenological Approach

A phenomenological approach was specifically utilized to understand the phenomenon of undergraduate persistence among women. Among the many qualitative typologies, phenomenology was applicable because it allows me to thoroughly examine a shared experience amongst participants (Creswell, 2013). In using phenomenology, I recognize the value of participants' perceptions, senses, and ways they construct knowledge (Moustakas, 1994). I also acknowledge that these women have a shared consciousness of the difficulties they face as minorities in their respective fields and that they are intentionally working for the same outcome (graduation from their individual degree programs). During each qualitative interview, I sought to understand the essence (Polkinghorne, 1989) of each participant's experiences—that is the fundamental and potent attributes of their undergraduate careers in science and technology. Using a phenomenological approach, my aim was to engage in "bracketing" by withholding my own assumptions or explanations for participants' experiences (Gearing, 2004).

Data Collection

To collect data for this phenomenology, it was essential that I spent extended time in the field and understood the shared phenomenon —namely, the success of women in undergraduate science and technology majors in Ethiopian universities. Fourteen women who have studied (in their final year or an alumna) a science or technology discipline at one of three public Ethiopian higher education institutions—Addis Ababa University, Bahir Dar University, and Hawassa University—were recruited. The sample size (n=14) was determined to ensure that theoretical data saturation (Fusch & Ness, 2015) was achieved and meaningful themes emerged during analysis. These individuals have experienced similar victories and challenges while pursuing their education, and they also had similar core values and beliefs (Fetters et al., 2013). Living and carrying out the research in Ethiopia for a prolonged period was necessary to gain suitable access to the community. After coming into contact and building rapport with study participants, I relied primarily on participant interviews. For these interviews, a semi-structured interview protocol (written in English) was employed to understand their lived experiences and identify factors that have helped them succeed at their respective universities (see Appendices E, F, and G). With participants' permission, all interviews were audio-recorded and professionally transcribed. In addition to the interviews, artifacts of women's experiences in higher education (such as pamphlets, classroom observations, photos of campus, etc.) were collected.

Sample Selection

The qualitative research portion was conducted based on the experiences of students who have attended three public universities in Ethiopia: Addis Ababa University, Bahir Dar University, and Hawassa University. All three universities are in urban centers and are financed predominantly by the Ministry of Education. A brief description of each institution is included below.

Descriptions of Institutions

Institution 1. Addis Ababa University (AAU) is Ethiopia's oldest and wealthiest public university. This prestigious higher education institution was established in 1950, and currently enrolls 16,349 full time undergraduate students—women account for approximately 32% of this undergraduate population (Kelemu, 2013). One distinguishing factor of AAU is that the leadership of this institution hopes to transform this university from a primarily undergraduate institution to a larger, research-based university serving a predominantly a graduate population (AAU, 2015) Correspondingly, this institution has taken on the responsibility of training enough Master's and PhD level faculty members to staff AAU itself *and* other newer institutions (Mohamedbhai, 2011; Saint, 2004). Under the leadership of the Ministry of Education and institutional president Dr. Admasu Tsegaye, AAU has made a commitment to produce between 4,000-5,000 PhD graduates between 2009-2018 (Mohamedbhai, 2011). In order to reach this ambitious goal, AAU is collaborating with universities outside of Ethiopia to host visiting professors that will teach and mentor a portion of enrolled graduate students (Mohamedbhai, 2011). In addition, administrative leaders have made structural changes

such as: supplementing the graduate school libraries, acquiring new laboratory equipment, and requiring that all qualified local faculty members mentor 8-10 graduate students in their respective fields (Mohamedbhai, 2011). In this study, multiple campuses of AAU are represented, including the College of Natural Sciences (abbreviated as CNS, and colloquially referred to as the "4 Kilo" campus), the Institute of Science and Technology (abbreviated as IST, and colloquially referred to as the "5 Kilo" campus), and the Ethiopian Institute of Architecture, Building and Construction (abbreviated as EIABC, and often called the "Lideta Campus").

Institution 2. Bahir Dar University (BDU) is a higher education institution in the northwestern city of Bahir Dar. This research-intensive institution was established in 2001, and currently enrolls 11,600 full-time, undergraduate students across four campuses (Kelemu, 2013; Mulu, Abera, & Yimer, 2014). Female students comprise nearly 41% of the undergraduate population (Kelemu, 2013). As one of the largest universities in the country, BDU has a variety of colleges and institutes, including the College of Science, the College of Medical and Health Science, the College of Agriculture and Environmental Science, and the Institute of Technology (Ayele, 2013). In recent months, anti-government civilian protests in the city of Bahir Dar (BBC, 2016) have presented potential danger and political tension for BDU students.

Institution 3. Hawassa University (HU) is a higher education institution in the southern city of Hawassa. Before becoming a research-intensive university, this institution formerly focused mostly on agriculture offered degrees primarily in dry-land farming, land-management, and agricultural engineering and mechanization. Over the

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years, the institution expanded to include a college of forestry, a college for teacher education, as well as health sciences. HU is now a research-intensive university with a multitude of colleges and institutes, including the Institute of Technology and the College of Natural Sciences (Bachore, 2016). Currently, the enrollment is estimated at 13,546 full–time undergraduate students; with female students make up approximately 29% of all undergraduate students (Esaiyas, 2018; Kelemu, 2013).

Participant Recruitment Strategies

Individuals eligible for participation in the study were women who have studied a science and/or technology major at a public university in Ethiopia. To participate in this study, individuals needed to fit the following specifications

- Be an undergraduate student in their final year; or alumni of Addis Ababa, Bahir Dar, or Hawassa University
- Identify as a woman
- Currently reside in Ethiopia

I utilized multiple recruitment strategies to arrive at the final number of participants, including: working with AAU faculty and staff, strategic emailing, and participant referrals (snowball sampling). Within a few days of arriving in Ethiopia, I met with Dr. Berhanu Assefa, a research fellow at the Institute of Educational Research at Addis Ababa University. He recommended that we first go to the AAU CNS campus to identify eligible students. We reviewed the various schools, centers, and program units of the college to see the sort topics that students majored in. Specifically, we found that College was dived into the following:

- Institute of Biotechnology

- Department of Chemistry

- Program Unit for Computational Science

- Department of Computer Science

- School of Earth Sciences (includes the Geology major)

- Center for Environmental Science

- Center for Food Science

- Institute of Geophysics, Space Science and Astronomy

- School of Information Technology

- Program Unit for Materials Science

- Department of Mathematics

- Department of Microbial, Cellular and Molecular Biology

- Program Unit for Paleoanthropology and Paleo-environment

- Department of Physics

- Department of Plant Biology and Biodiversity Management

- Department of Sport Science

- Department of Statistics

- Department of Zoological Sciences

Dr. Assefa then suggested we use a GPA lower limit of 2.5 to identify high-achieving students. While I did not use this marker for the rest of the study, it was a useful tool for narrowing down a sample population. Next, Dr. Assefa and I then went to the university registrar's office to get list of women's names that fit the eligibility criteria. We found

that of the 18 units in the College of Natural Sciences, only five units had graduating

female students with a cumulative GPA of 2.5 or higher. After these students were

identified, Dr. Assefa and the gender office employees worked together to contact them

and introduce me to those who were interested. This recruitment strategy led me to

meeting and interviewing four participants (pseudonyms: Alem, Liat, Selam, and Tiya).

Additionally, Dr. Assefa facilitated recruitment of participants at AAU's IST. He started

by connecting me with a current engineering professor at the campus, named Dr.

Abraham. In turn, Dr. Abraham shared my telephone number with female senior students

who he considered a good fit for my study. Unlike Dr. Assefa, Dr. Abraham did not use a

minimum GPA score as a selection criterion. Rather, he reached out to individual

students who he subjectively deemed as fitting candidates for the study. Using this

recruitment technique facilitated by Dr. Abraham, I met and interviewed two more

participants – Abigail and Fanta.

Next, I sent emails to colleagues, friends, and acquaintances that might know

eligible individuals. After receiving referrals from people in my network, I sent potential

participants a recruitment email (Appendix C) that outlined the study. Using this

technique, I connected connect with: Eskedar, Feven, Melat, Nardos, Sewit and Yeshi.

Additionally, purposeful and snowball sampling (Atkinson & Flint, 2001; Coyne, 1997)

was utilized because some of these word-of-mouth referrals brought along their own

friends to participate in the study. Combined, these varied recruitment strategies allowed

me to reach the desired number of participants (n=14).

Participant Profiles

The study interviewee sample included 14 women, but only 12 completed all interviews (the remaining two participants dropped out of the study after the first interview). Three public universities are represented (Addis Ababa University, Bahir Dar University, and Hawassa University). The bulk of participants (n=10) were current students or alumni of Addis Ababa University. Meanwhile, one participant was from Bahir Dar University and one from Hawassa University. The heavy sampling from Addis Ababa University is a limitation of this study. However, since three distinct campuses—each with its own specialization, faculty, and admission process—of this university are included, sample variation is partly maintained.

During data collection, I met with participants in various locations - on their university campuses, in hotel lobbies, and in office buildings. Most participants studied engineering (Civil Engineering: n=5, Chemical Engineering: n=1, and Electrical Engineering: n=1). The other participants studied Biology (n=2), Geology (n=1), and Statistics (n=2). Half of the interviewees *(n=7)* said their hometown was Addis Ababa, while the other half were born in smaller Ethiopian cities like Adama, Gamiti, Gojam, Harar, Jijiga, and Sebeta. Only one interviewee was born outside of Ethiopia—Yeshi was born in Moscow, Russia. Additionally, interviewees generally attended private high schools, such as Nazareth School in Addis Ababa (n=5), St. Bradley Church School in Addis Ababa (n=2), Medhanialem Preparatory School (n=1), Nativity Girl's School (n=1) in Addis Ababa, St. Mary's Catholic School in Addis Ababa (n=1), and St. Joseph School in Adama (n=1). The only public high school represented in the sample was

called Higher 23. Interviewees' college GPA ranged from 2.3 to 3.79, and the average GPA was 3.10. A description of each participant is available in the next section. Additionally, Table 2 includes a summary of key demographic indicators of all participants.

Interviewee 1: Abigail. Abigail is a fifth-year Civil Engineering student at Institute of Science and Technology (5 Kilo campus) of AAU. Born and raised in Addis Ababa, she explained that she has wanted to attend AAU and major in engineering since she was in 7th grade. In fact, while she was in high school, she turned down an offer from New York University to visit the undergraduate program because she had her heart set on attending a university in Ethiopia. Abigail comes from a highly educated immediate family: she is the daughter of a pharmacist and an accountant; while her older brother is currently pursuing his Master's degree in engineering at the same institution. She noted that she, like the rest of her family members, is an Orthodox Christian.

I was introduced to Abigail through one of the professors on her campus. When we first met, I was struck by her command of the English language—down to the colloquialisms that Americans often incorporate in their conversation. During our first interview (04/04/2017), she recommended that we just find a slab of concrete (a makeshift bench) in the parking lot of AAU to sit and talk, and we ended up meeting there for all future meetings. The first conversation with Abigail was easy, and I felt like I was talking to one of my friends. During our second meeting (04/07/2017), she mentioned that she lives at home, and looks down on on-campus accommodation. It was clear during this conversation that she is more invested in learning the material and

enjoying her university experience, rather than a high GPA. When she met me for our last conversation (on 04/11/2017), she brought along and introduced me to Fanta, a student that I would interview later. Logistically, meeting with Abigail was relatively simple. Windy weather would occasionally make recording difficult (particularly during our second conversation). Outside of this minor inconvenience, interviews with this participant were among the most enjoyable because Abigail was gregarious and seemed at ease with the questions I was asking her.

Interviewee 2: Alem. Alem is fourth-year Geology undergraduate at the College of Natural Sciences in AAU. Throughout our interviews, she appeared to be a shy, demure young woman who was reluctant to provide any details about her experiences, unless I explicitly asked. She mentioned that she is the oldest of four children, and as the first person in her family to have access to higher education, there is an additional pressure to succeed and be financially stable. Specifically, when I asked her how her family feels about her being in university, she explained: "[They] expect more from – because in our family, my – I am the first to go, and they expect from me." She is originally from Gojam, a region in the northwest corner of the country; and hopes to eventually work as a professor in a university after obtaining her doctoral degree in Geology.

Overall, the interview process with Alem was challenging. Our first meeting (on 04/04/2017) took place in the campus gender office of the AAU 4Kilo campus. As we spoke, it seemed like Alem was terrified of me at first—she seemed very reluctant about signing a waiver, being recorded, and answering specific questions about her upbringing.

Perhaps she found my questions invasive and prying, since I was asking about the details of her individual life, rather than questions about the "female" experience in public universities. Our second interview (on 04/05/2017) was a bit easier, as she grew accustomed to my interviewing style. Our third interview (on 04/06/2017) was the most relaxed, but we were interrupted multiple times as gender office staff members walked in and out to retrieve items and papers from the space (causing their keys to jingle, the office door to creak, etc.). In retrospect, I should have done more to build rapport as a researcher, including sharing more about my own journey in education and speaking with her exclusively in Amharic. If I had done this, perhaps Alem would have found my questions less invasive and saw me as fellow student, instead of an interrogator. Notwithstanding the logistic challenges of the interview process, I could tell that, in relation to all other study participants, Alem appeared to be the most resilient. She told me that she has gone through her university career with "no anything, no support" but she still managed to have the highest GPA (3.79) of all interviewees.

Interviewees 3 and 4: Bisserat and Eskedar. Bisserat and Eskedar are Civil and Environmental Engineering students at the IST campus of AAU. As long-time friends and classmates, they asked to be interviewed together. At first, this request concerned me because of how each participant's privacy would be compromised. If both were interviewed together, I feared that each participant would withhold from sharing painful or negative experiences with me while her peer was in the same room. While this may have occurred, the benefits of carrying out a paired phenomenological interview seemed to have outweighed the potential limitations. Because Bisserat and Eskedar were

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interviewed together, they seemed to grow comfortable with the interview process more quickly than others who were interviewed one-on-one. During the first and second interview, these women would often build on one another's responses, and would frequently add detail and context for one another's anecdotes. Thus, this methodological decision turned out to have a positive impact on the research process.

While talking to them, I learned that Bisserat was born in Jijiga (a city in the Somali region of Ethiopia), raised in Addis Ababa, and is the middle child in a family of three children. Meanwhile, Eskedar is an Addis Ababa native, and a part of a large family – she has six older siblings and one younger brother. Both Bisserat and Eskedar are Orthodox Christians. When I first met them, they told me that they were not enrolled in coursework but were instead completing their internship hours. From March to June 2017, they were interns at a design agency, and during the remainder of the summer months, they continued working at the same design agency. In the subsequent months, they planned to work as construction engineering interns at the MIDROC Ethiopia Technology Group.

Meeting with these two women felt more like a social encounter instead of a formal research interview process. For all three sessions, we meet at the lobby café of Capital Hotel and always ordered hot beverages and pastries. The relaxed atmosphere of the interview setting probably contributed to the easy flow of conversation between these participants and me. During our first interview (on 06/09/2017), they mentioned that people often joke that they are lesbians because they are always together. Both participants expressed that they prefer friendship with male students during the second

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interview (on 06/16/2017), which was amusing since they were clearly good friends with one another. For the last interview (on 06/24/2017), Eskedar was on time but Bisserat was running late, so I ended up completing their interviews separately (although Eskedar was a silent observer of Bisserat's interview). It was during this final interaction, when I could have separate interactions with these two women, that I clearly noticed that Eskedar was far more proficient in English than Bisserat. This observation reinforced my pre-data collection fears about the limited utility of English for this project. While most interviewees could communicate freely in English, select participants—like Bisserat, Alem, and Liat—seemed to have difficulty expressing their ideas and emotions in this language. Methodologically, this was a limitation because it prevented me from collecting rich data from a representative sample of students. As subsequent sections of this study demonstrate, most women enrolled in Ethiopian higher education are probably like Bisserat in their mastery of English. Thus, using a language that is not aligned with their cultural orientation was prohibitive.

Interviewee 5: Fanta. Fanta is a fifth-year Civil Engineering student at AAU IST (5Kilo campus) and a previous intern for the Chinese Communication Construction Company, a well-known firm in Ethiopia. In addition to being a high-achieving engineering student, Fanta is also talented in languages. She is fully proficient in English and Amharic, and also speaks Tigrinya (one of the three major national languages in Ethiopia). Additionally, she speaks a bit of French, Arabic, and Korean. Despite her many talents in these fields, she says her passion is neither engineering nor languages. Rather, she would prefer to study programming, computers, or architecture. When I asked

her to explain her religious background, she stated matter-of-factly: "So my family is Orthodox, so therefore, I'm, by birth or by association, Orthodox. But – and I learned in a Catholic school. So basically, I'm a Christian."

Similar to Abigail, Fanta asked to meet her at AAU IST, in the parking lot. Our first meeting (on 04/17/2017) was the day after Easter, and the campus was relatively quiet. As we spoke, she often stopped to greet friends that walked by. Fanta seemed comfortable with the interview protocol, and often elaborated in her responses without prodding. During our second interview (on 04/19/2017), she explained that she recognizes that there is a prevalent stereotype that women from the city, like her, are elitist: "But I guess, there's like a real invisible line between people from out of town and from like Addis Ababa. They think we are like spoiled, I guess, a little bit." When I arrived at our usual meeting spot for the third interview (04/21/2017), I noticed a group of (presumably) Muslim women doing their prayers under a tree in the corner of the parking lot. By the time Fanta arrived, there was already a group of students seated in our meeting area so we walked around the campus, trying to find a quieter place to talk. As we walked from building to building, she was often stopped by male schoolmates who greeted her. The tendency of men to greet Fanta stood out to me because of a comment she made during our second interview. When describing how she and her classmates dealt with obstinate faculty members, she shared that it was usually easier to send a student representative of the opposite sex to ask that faculty member for leniency on course assignments and exams. When I asked Fanta to explain why she thought that way, she told me:

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But like some girls are hard to – I guess there's like that concept of flirting, I guess. It's not flirting to where it like goes somewhere. Just like when you talk to a girl or a guy between opposite sex – when you talk to your opposite sex, you tend to be – smile more and – I guess, just – in that way.

Fanta's comments and the ease with which she seemed to interact with her male schoolmates was striking. While she may not have readily admitted to the salience of her own gender identity, she deeply understood gender dynamics and had mastered the navigation of gendered spaces.

Interviewees 6 and 7: Feven and Netsi. Feven and Netsi are friends and alumni of AAU's five-year long Construction Technology and Management major. While I spoke only to Feven during the recruitment process, she brought along Netsi to the first interview, so I decided to interview them together. Both women are from Addis Ababa, first generation university students, were originally interested in health careers, and were explicit about their dislike of their undergraduate major.

Feven is the middle child of a large family. When I asked her how many siblings she had, she simply stated, "I have a lot. I have a big family…like cheaper by [the] dozen." While she was in high school, her preferred discipline was medicine but she did not score high enough on the university entrance exam to be assigned to a medical school. Her negative experience in university is primarily a function of her dislike of the subject material. She described: "So I'm not very good at calculation things, but I'm very bad at drawings. I suck at drawings. And construction, you need to read the drawings…So it was very, very hard at first here – very hard. It didn't match. What I

wanted was medicine." After graduating, she has had a string of employment opportunities that are not directly related to her studies, including working as a secretary, as a wedding decorator, and as a salesperson for a staffing agency (her current position). Meanwhile, Netsi is the youngest in a family of three children. She explained that "…both my mom and my dad are not educated. My dad used to be a merchant." Netsi currently works outside of the construction management industry.

Our first conversation (on 04/08/2017) took place in the lobby of café of Capital Hotel in Addis Ababa. We engaged in a lengthy and rich conversation, filled with jokes laughter. When I followed up to schedule subsequent interviews, Feven and Netsi asked to reschedule multiple times. Disappointingly, they both eventually withdrew from the study after the first interview.

Interviewee 8: Liat. Liat is in the third and final year of her B.S. in Biology major at Addis Ababa University. She is a soft-spoken, somber young woman from Gamiti, a town in the Oromia region of Ethiopia. She disclosed that she is the eldest in a family of three children and that she speaks Oromifa (one of Ethiopia's three national languages). Among all her university courses, she mentioned that she enjoyed Ecology the most. After graduating, she plans on pursuing her Master's degree and working in a position that will make a positive impact in her community. She also noted that she has an aunt that graduated from AAU who gives her career advice and serves as a role model.

Our first meeting (03/23/2017) took place in an empty lecture hall on the AAU CNS campus. As she responded to my questions, there were many instances when I wanted to provide commentary and share my own experiences, particularly when she

discussed the familial dynamics of being the eldest female child in her family. I also

noticed that she seemed reluctant to say anything critical about her upbringing or pre-

university schooling. The second (on 03/27/2017) and third (on 03/28/2017) time we met,

we spoke in the campus gender office. In their efforts to be welcoming and helpful, the

gender office staff inadvertently became disruptive. For example, the director of the

campus gender office sat in on the duration of Liat's second interview, which may have

prevented the interviewee from being totally honest about her experiences at the

institution.

Overall, Liat seemed indifferent about the research process. She provided details

only when I pressed, which suggests that I did not establish adequate rapport. Moreover,

while she could answer each of my questions, her response in English were slow and

measured, which might indicate that she would have rather completed in the interview in

a local language.

Interviewee 9: Melat. Melat is a 29-year old AAU alumna (she graduated with a

degree in Applied Biology) and a current PhD student at the same institution. She is

pursuing a terminal degree in biomedical science, with a research agenda focused on

immunological responses to pneumococcal vaccinations. As a bench scientist, she

lamented the lack of laboratory infrastructure for undergraduate students. She explained

that she did not have meaningful learning experiences in a laboratory until she was

Master's student: "When I have the exposure to the lab is when I was studying my MS –

my MSc, not when I was an undergraduate student...That was the biggest drawback here

in this campus when we were undergraduate students." Like a few others in this study,

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Melat was formerly interested in studying medicine, but did not score high enough on the entrance exam to attend medical school. She also comes from a family of multiple university-educated siblings. Speaking to Melat felt like speaking with one of my close friends—she was warm, self-aware, and charming.

All interviews with Melat (which took place on 04/05/2017, 04/18/2017, and 04/21/2017) were carried out in the AAU CNS gender office. During our first conversation, she brought up how her early education (grades 1-6) took place in a monastery, and that her earliest memory of teachers is of Catholic nuns. She also told me that she wanted to attend Hawassa University, instead of her alma mater, because many of her high school friends were going there. In interview two, she demonstrated her friendly personality as she summarized her experience living in the campus residence halls: "Fortunately, I love all the experience I had in my dorms. I had a good dorm mates…I am social. I can meet people and become friendly so easily. So it was not difficult for me." While discussing her career plans during interview three, she explained that she would be going to Stockholm for a short-term immunology research project.

Interviewee 10: Nardos. Nardos is an alumna of AAU IST, where she earned a B.S. in Chemical Engineering. She is 26 years old, originally from Addis Ababa, and the youngest of three siblings. Among her family members, Nardos mentioned that she is closest to her older sister, who is readily available for guidance and support: "She has been – she was in the university before me…So when I have a problem or when I have a specific thing that I want to do, like where to go to, who to talk to, she pretty – give me the directions to do." While in university, Nardos had a variety of practical, formative,

experiences that helped her develop her engineering skillset, including: internships at St. George's Beer Company and a detergent factory, as well as a senior thesis project, during which she completed an analysis of high quality starch production from cassava plants. Since graduating, Nardos has worked at a chemical plant—first as a quality control manager, and then was promoted to a production manager. After working for a few more years, she hopes to pursue her Master's degree outside of Ethiopia and eventually start her own business.

Nardos and I decided to meet in the lobby café of Capital Hotel for all three of our interviews (which happened on 04/22/2017, 06/03/2017, and 06/06/2017). Conversations with her came easily, partly because her English was impeccable and because she was open about her story—she oftentimes spoke for long stretches of time without any guidance from me. After the formal interviews ended, we would often linger in the café to talk about life outside of research and work. For instance, we had conversations about my experiences as a first-generation immigrant in the U.S, particularly my thoughts on race and racism. She was curious to learn more since she was preparing to go to Indiana for a 3-month long professional development experience. While she was excited to explore a country that she has previously not been to, the coverage she saw on the news about the treatment of Black people in the U.S. made her nervous.

Interviewee 11: Selam. Selam is a senior at the AAU (CNS campus). She is studying Statistics and maintains a 3.33 GPA. Although she originally wanted to study a healthcare discipline (like medicine or radiography), she has grown to enjoy her major. Selam grew up in Adama (a town about 45 kilometers away from Addis Ababa), is the

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middle child of a family of three siblings and has one living parent. Her older brother studies Construction Management at AAU, while her younger sister is a ninth-grade student. While enrolled in university, Selam has not felt particularly homesick since her hometown is relatively close and she can easily visit her family. Additionally, she explained to me that she has been heavily involved in Orthodox Church activities since starting college, especially through opportunities to serve in music ministries. After graduating in the spring, Selam plans to apply to a Master of Science program and then a PhD program. She is unsure about what career she wants to pursue.

Selam and I met in the AAU CNS campus gender office for all our interviews. During our first meeting (on 03/28/2017), she spoke highly of her high school. Unlike many other interviewees, she felt like her secondary school prepared her well for science higher education. Thinking back to those years, she relayed: "…We had a laboratory class, computer lab class, and everything…if we've done something that's good, we'll have a reward…As science students, they support us very well." In our second meeting (on 03/30/2017), she shared that she has had a difficult time living in on-campus housing. She described the campus dormitories as ugly, hot, and uncomfortable. During our final meeting (on 03/31/2017), I asked her what she would advise younger women who are about to embark on the university journey. She explained that young women should study what they enjoy, not what others pressure them into: "…they can go continue by their own choice and their own option. No one can interfere that."

Interviewee 12: Sewit. Sewit is the most memorable interviewee and my favorite participant in this study. Undoubtedly the most self-assured, critical, and humorous

person I came across in the research process, I enjoyed every interaction I had with her. She is an alumna of Bahir Dar University, where she studied Electrical and Computer Engineering. Immediately after graduating from college, she had a stint working as a Physics lecturer at Hawassa University for nine months. Following that, she moved to Finland, where she earned a Master's degree in Communication Ecosystems & Mobile Network Economics. She's also an alumna of the Young African Leaders Fellowship at Dartmouth College, where she was trained in business and entrepreneurship. Her employment history thus far is comprised almost exclusively of tech startups. When I asked her about her long-term career plans, Sewit replied: "I usually see my life in one-year basis, maximum two years at once…that's a good enough time to understand a space or industry or a country or a job and to see if it makes sense for me or not."

During our first interview (on 06/21/2017), I met Sewit at Sapphire Addis Hotel, where we ordered warm drinks and pastries as we talked. She mentioned during this conversation that she considers herself a millennial, and that she has traveled to 14 countries in Africa as part of her scope of work for a previous employer. The next time we met (on 06/22/2017), it was in a meeting room of a co-working space in the heart of the city. Our third meeting (06/27/2017) was back at Sapphire Addis.

Of all participants, Sewit is the one who helped me most clearly see my insider-outsider researcher positionality because she simultaneously became a study participant and my friend. Additionally, because we have many mutual friends who live in Addis Ababa, we would often run into each other in coffee shops, restaurants, and parties—long after the interviews ended. This constant exposure to this study participant blurred the

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line between the research and my own personal life and made me more aware of my subjectivity as a researcher.

Interviewee 13: Tiya. Tiya is a third-year Statistics student at AAU CNS. She was born and raised in Addis Ababa and is the eldest in a family of five children. When I asked Tiya if she enjoyed her major, she looked at me blankly, and responded, "I'm indifferent." Later on, she explained that she did not have much guidance from mentors to identify her interests while in high school. Like many others, she was interested in medicine at one point, which she explains is "…just common for everybody." At the time of our conversations, she had failed two classes and had a cumulative GPA of 2.73. Once she graduates, Tiya is unsure about what career path she will take, but she did point out that she would rather pursue a career in journalism, rather than statistics.

Tiya and I agreed to meet in the AAU CNS gender office for all interviews. During our first conversation (on 04/18/2017), she explained that the most transformative education she has had took place while she was in middle school, attending an institution called New Life Academy. When talking about this school, Tiya shared: "…it was amazing time for me. I learned a lot of things. I have several teachers who supported me and who are very close to us, who care for us…And that was the best time for me in my academic life." She attributed her high score on the secondary education certification examination (administered at the end of 10th grade) on the preparation she received at New Life. Our second meeting (on 04/19/2017) helped me learn that Tiya has greatly benefited from the initiatives offered by her campus' gender office. For instance, the staff of the gender office worked with her during the second semester of her freshman year,

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when she endured a traumatic life event in her family (she did not disclose the details). Once the gender office staff members recognized Tiya was having difficulty keeping up with her classes, they communicated with the dean of her college and her professors to help her get back on track. She shared similar narratives during our third meeting on 04/20/2017.

  Interviewee 14: Yeshi. Yeshi is an entrepreneurial scientist. She is a 28-year old alumna of Hawassa University, where she studied civil engineering and graduated with a 2.3 GPA. Yeshi was born in Moscow, Russia, and raised in Ethiopia by two highly-educated parents. She describes herself as an efficient person, and that "I have to do something always. I have to keep myself busy. Immediately after graduating for Hawassa, she had trouble finding an engineering position, so she opened a small shop to generate an income. Eventually, she went on to work as an engineer for organizations like Dangote Industrial and the World Food Programme. Currently, Yeshi is in the process of launching an agriculture start-up business with her husband.

  Yeshi and I met at in an office building in a bustling neighborhood of Addis Ababa for all three interviews. During our first meeting (on 03/28/2017), she told me that one of the most surprising aspects of her transition to higher education was the complete freedom she had as a college student living far away from family. Since her college-town is oftentimes a tourist destination, Yeshi was initially overwhelmed by the plethora of non-academic activities that could take up her time: "So that aspect, it was very different. The city, it's a very nice city. Actually, I can say tourist attraction city. So there was a lot of things going on. It was a very large city." During our second interview (on

03/30/2017), Yeshi brought up the importance of just "enjoying" the journey of education, and how her mother encouraged her to do that while she was enrolled. She also acknowledged how this outlook on education is counter-intuitive for a context like Ethiopia, in which student students are often encouraged to study the most lucrative career that will keep them out of poverty. After we concluded the third interview (on 04/03/2017), Yeshi encouraged me to keep in touch and even suggested that we go out for beers sometime. While I never took her up on this offer, I appreciated her welcoming gesture.

Pseudonym	Institution*	Major (Bachelor of Science)	GPA	Hometown	High School
ABIGAIL	Addis Ababa University, IST	Civil Engineering	3.1	Addis Ababa	Nazareth School
ALEM	Addis Ababa University, CNS	Geology	3.79	Gojjam	Not disclosed.
BISSERAT‡	Addis Ababa University, IST	Civil and Environmental Engineering	3.0	Jijiga	Medhanialem Preparatory School
ESKEDAR‡	Addis Ababa University, IST	Civil and Environmental Engineering	3.0	Addis Ababa	Nazareth School
FANTA	Addis Ababa University, IST	Civil Engineering	3.0	Addis Ababa	Nativity Girls' School
FEVEN**	Addis Ababa University, EIABC	Construction Technology and Management	3.11	Addis Ababa	St. Bradley Church School
LIAT	Addis Ababa University, CNS	Biology	3.14	Gamiti, Oromia region.	Not disclosed.
MELAT	Addis Ababa University, CNS	Applied Biology	3.52	Sebeta	Higher 23
NARDOS	Addis Ababa University, IST	Chemical Engineering	2.94	Addis Ababa	Nazareth School
NETSI**	Addis Ababa University, EIABC	Construction Technology and Management	3.13	Addis Ababa	St. Bradley Church School

SELAM	Addis Ababa University, CNS	Statistics	3.33	Adama	St. Joseph's School
SEWIT	Bahir Dar University	Electrical and Computer Engineering	3.28	Harar	Nazareth School
TIYA	Addis Ababa University, CNS	Statistics	2.73	Addis Ababa	Saint Mary's Catholic School
YESHI	Hawassa University	Civil Engineering	2.3	Moscow, Russia	Nazareth School

Table 1. Key Demographic Indicators of Interviewees

* Acronyms:
   CNS stands for the College of Natural Sciences, colloquially referred to as the "4 Kilo campus
   IST represents Institute for Science and Technology, colloquially referred to as the "5 Kilo campus"
   EIABC is Ethiopian Institute of Architecture, Building and Construction, often called the "Lideta Campus."
‡Participants asked to do interview 1 and 2 together; but interview 3 separately.
**Both participants dropped out of the study after the first interview.

Composite Narratives of Study Participants: Imagining "Desta" and "Aida" as Archetypes

In this sub-section, I present two composite narratives about the fourteen women who were interviewed in this study. While the practice of writing a composite narrative can homogenize participants' experiences in some ways, it is nonetheless a useful analytical tool for highlighting intra-group trends that surfaced in phenomenological data. Such narratives can add depth to qualitative analysis by contributing to "…an embodied relational understanding of a phenomenon that is the experience of another" (Wertz, Nosek, McNiesh, & Marlow, 2011, p. 9). The first archetype is *Desta*, a fictional character who is subdued and suspicious. This archetype shares the characteristics of women I expected to encounter more frequently in the research process. Desta lives at the intersection of multiple marginalities and occasionally seeks out institutional services that are distinctively designed for female students. In this regard, Desta represents interviewees like Alem, Bisserat, Liat, and Melat. The second archetype is *Aida*, a fictional character who is gregarious and wealthy. She enters the university with immense cultural, social, and economic capital; this has made her reluctant to view herself as a marginalized student just because she is female. In this regard, Aida symbolizes most interviewees, including: Abigail, Eskdedar, Fanta, Feven, Nardos, Netsi, Selam, Sewit, Tiya, and Yeshi. The characters of Desta and Aida are not designed to collapse the humanity of each interviewee into a cliché. Rather, I use them as a tool for synthesizing a copious amount of rich interview data. These composite profiles are also used to frame

the recommendations in the penultimate chapter of this study (Chapter 5: Recommendations and Implications).

Archetype 1: Desta. When texting with Desta to set up our first meeting, she requested we meet in the gender office of her university's campus. When she entered the room on the morning of our initial interview, I did not realize she had arrived because she did not speak immediately. Instead, she looked at a staff member in the gender office who was sitting behind me and stood by the door until someone addressed her. I smiled lightly and asked, "Desta?" She shook her head in the affirmative. I introduced myself and stood up to hug her. She stiffly hugged me back and quickly gathered her arms. She gave me a polite nod after I thanked her for meeting with me, and I noticed that she sat down only after I sat down. That morning, Desta also spent a long time reviewing the study consent form and appeared wary about my decision to record our conversation. As we talked, I noticed that she would absentmindedly smooth out her long skirt and tug at one of the cornrows in her hair.

Establishing a conversational flow with Desta was challenging. She often asked me to repeat my questions or say them slower. Meanwhile, I repeatedly asked her to speak up a little or further explain her curt answers. For example, when I asked her to tell me about the education level of her parents, she simply stated "they're not." To clarify whether this meant they were not university-educated or if they had never received any formal schooling whatsoever, I prompted her with the statement "say more about that." She looked puzzled, and then asked, "about what?" In instances like these, which came

up often, I would try to pepper my question with a few clumsy Amharic phrases to make myself clearer. This helped a bit, but not much.

Over the course of our three meetings, I learned that Desta was a profoundly religious person. In her second year, she joined the university's Orthodox Christian campus ministry that gave her an opportunity to sing in the choir and attend weekly Bible studies. She told me that her faith community on campus has helped her overcome a traumatic life event that took place in her first year of college. While discussing this, she recognized, "Oh, in the – in my first year, second semester, I was about to stop class and do it by some other reason. But I stayed motivated by the help of God in the first place…" Based on the snippets that she shared, I presumed that this traumatic event was a sexual assault incident perpetrated by someone in her family. This, of course, is conjecture. Desta did not seem keen to share the details, and I did not push. In addition to drawing strength from religion, she seemed motivated by her five younger siblings who looked to her as an example. While she did not get to frequently visit them in her rural hometown in the Oromia region of Ethiopia, she knew that her success in university would be a major milestone for her entire family.

When Desta was still enrolled in her small public high school, she aspired to become a physician. However, she did not score high enough on the university entrance exam to be placed at a medical school. Instead, she was allotted a spot in the Geology department of her university. Over time, she seemed to have grown mildly fond of the discipline, although she acknowledged that she would have probably enjoyed a computational discipline such as Statistics or Mathematics more than her assigned major.

Despite her GPA being one of the highest in her cohort, she did not seem particularly optimistic about a career in the Geology field. Instead, Desta planned on applying for graduate programs and employment in Europe, Australia, and the United States. When I asked her if she would miss Ethiopia if she left, she nodded and mumbled "of course." After our last interview ended, I told Desta that she could reach out to me any time with questions about the study. I also encouraged her to reach out for any advice about graduate school applications to U.S. universities, and I let her know I would be happy to help her in any I could. She nodded curtly and whispered thank you. I have not heard from Desta since then.

Archetype 2: Aida. When I met Aida, one of the first details I noticed about her was the meticulous way she had styled her hair. Her hair was long, voluminous, and arranged around her face in perfect spirals that had been dyed a deep burgundy color. Her taste in clothing was equally memorable: she sported stylishly ripped jeans, a loose-fitting blouse, and black combat boots. When she spotted me in the corner of the juice bar where I was waiting for her, she tucked her iPhone into her cross-body purse and walked quickly over to me. Even though it was our first interaction, her face broke into a wide smile when she said hello, and then hugged me tightly, as if she was greeting a close friend she had not seen in years. As we spoke, she would swing her feet against the bar stool she was seated on, causing the back zipper of her combat boots to clink against the steel.

Throughout the course of our conversations, I learned that Aida is an Addis Ababa native who wanted to remain in the city after graduating. She was also the

youngest child in a small, tight-knit family. She lived with them in the affluent *Ayat* neighborhood of Addis Ababa. Although this required her to have a long, daily commute to campus, Aida mentioned that she preferred it that way because the university's residence halls were not as comfortable as her home. When describing her family members, she told me that her parents lived in Moscow for a few years before she was born, and had advanced degrees from Russian universities. Her father was retired, but used to be the dean of the national Defense Engineering University in Debre Zeit, Ethiopia. She had only one sibling—an older brother who was pursuing a graduate degree in engineering at her same university. She referenced him often and explained that he has always looked out for her while she has been in college. With a shrug, Aida also mentioned that she was Orthodox Christian by default, since she was raised in an Orthodox Christian family.

Aida was excited to graduate from her university and put her civil engineering degree to good use. While she recognized that the Ethiopian market for civil engineers was competitive, she was confident about her job prospects because her grades were high. When I asked her to reflect on what had been most difficult about college, she paused and said that was hard to say. To jog her memory, I asked her if she remembered a particularly hard aspect of her engineering classes, specifically. In response to this, she crinkled her nose, shook her head, and said, "Well, it has been my preference since high school. I wanted to study engineering since high school, since I was in 7th grade." Aida also credited much of her academic success in university to her K12 education. She said

that women who attended her alma mater, the prestigious Nazareth School, tended to do well later in life.

As I interrogated Aida about her experiences in higher education, she was also curious to learn about my own life history. She asked me about the motivations for my dissertation research, about Denver, and what I planned to do with my degree once I finished. Since she was so generous with her own knowledge and time, I happily chatted with her about my background and career plans. These conversations typically took place after I had already gone through the formal interview protocol, so I was rarely able to capture them on my recording device. It was during these informal conversations where I learned that Aida had traveled extensively within the United States, and had a few cousins that lived in Virginia. When we concluded all our interviews, Aida encouraged me to keep in touch. I was touched by her kind gesture and took her up on her invitations for lunch a few times. Regardless of what restaurant or café we met in during subsequent (non-research) meetings, I was floored by how many people she knew. People would constantly stop her to say hello or give her a quick hug. When I reflected on her massive network of friends and acquaintances, I was thankful Aida took time to include me in her life.

Non-Participant Observations and Document Analysis

In addition to the interviews, I completed non-participant observations within two campuses of Addis Ababa University as part of qualitative data collection. Cooper, Lewis, and Urquhart (2004) explain that the benefit of non-participant observation is that the researcher gets to better understand the roles and settings in which participants exist.

Accordingly, I had the chance to observe students as they studied in the library, participated in on-campus events, took notes in lecture, and ate lunch. I also gathered materials for document analysis. Bowen (2009) points out that document analysis allows the researcher to obtain empirical data in a process that is nonreactive and unobtrusive. The type and source of these additional data sources are summarized in the table below.

AAU Campus	Data Source	Date Collected	Photos (Y/N)
CNS	Non-participant observation – students in science library	03/22/2017	N
CNS	Document analysis – corkboard with flyers advertising course offerings and tutors	03/22/2017	N
CNS	Document analysis – list of graduating, female students with a GPA of 2.5 or above (confidential, first and last names included)	03/22/2017	N
CNS	Non-participant observation – "International Women's Day" celebration, hosted by the gender office	03/23/2017	N
CNS	Document analysis – brochure from gender office; outlines vision, objectives, and services offered by unit	03/23/2017	Y
CNS	Non-participant observation – undergraduate physics course	04/11/2017	Y
CNS	Document analysis – syllabus for undergraduate physics course: "PHYS 3032 – Mathematical Methods of Physics II."	04/11/2017	Y
IST	Non-participant observation – students in parking lot where students mill around and eat lunch	04/12/2017	Y
CNS	Non-participant observation – students, faculty, and staff as I walked around campus	04/19/2017	Y
CNS	Document analysis – corkboard with flyers advertising: various clubs, fellowship opportunities, and upcoming events	04/20/2017	Y
IST	Non-participant observation – students, faculty, and staff as I walked around campus	04/21/2017	N

Table 2. Summary of Non-Participant Data Sources

Data Analysis

After all interviews in the first phase of research were completed, the first step in analyzing the data was transcription. Because this is a phenomenological study, each participant was asked to participate in three distinct interviews (Hycner, 1985), and this resulted in about 40 interview recordings. Due to the large number of interviews, I used a transcription service rather than transcribing the interview recordings by hand. I utilized ADA Transcription Service and used the assistance of transcriptionist Erika Wassall (who can be reached at infor@adatranscriptionservice.com). Once Wassall provided me with the printed transcriptions of the interviews, I read through them in detail and wrote a 1-page memo about my initial responses and reflections for each completed interview. Memos are an important aspect of qualitative data analysis because they help researchers glean important ideas and conclusions from each interview (Polkinghorne, 2005).

Once this was completed, I then coded all the interviews in my data set. Basit (2003) defines codes as "…labels for allocating units of meaning to the descriptive or inferential information compiled during a study" (p. 144). In qualitative research, the process of assigning codes (to an individual, phrase, or sentence) allows the researcher to organize and make sense of textual, unstructured data. I coded transcripts electronically, using Nvivo software for Mac (QSRInternational, 2017) to help me identify emergent themes that capture the essence of study participants' experiences (Basit, 2003; Bazeley, 2009; Welsh, 2002). Using this software, I grouped emergent themes together. This reorganization and sorting of the data makes future retrieval of data easier. A total of 237 open codes emerged during data analysis in Nvivo, which I then organized into 12 nodes

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(see Appendix U for illustrations of the coding scheme). An analysis of the interviews was supplemented with information gleaned from non-participant observations and document analysis.

First Stage of Interface

Because this study is an exploratory mixed methods design, the first stage of interface happened after the collection and analysis of qualitative data. Study participants created their own categories of meaning (R. B. Johnson & Onwuegbuzie, 2004) about the experience of attending a public university and studying science or technology. I reflected on these categories of meaning and considered how they should impact the next phase of data collection. This process is formally known as *integration through building* (Fetters et al., 2013), since data from one phase informs the design and collection process for a subsequent phase. Empirically, this was important because certain ideas emerged in the interviews that I had not anticipated prior to speaking with participants. These ideas captured in codes that I incorporated into the emergent quantitative survey. For example, some of these emergent codes (taken from Nvivo) from the interviews include:

- Access to university-educated siblings (code correlates to survey question #2: "Do you have any brothers or sisters who have earned a university degree?")

- Tendency of participants to have attended private, single-gender, parochial high schools (code correlates to survey question #3: "What kind of secondary school did you attend?")

- Minimal female teachers/role models for most participants before starting higher education (code correlates to Likert scale question #11: "Having female teachers

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in secondary school was important to me"; and question #12: "Having female classmates in secondary school was important to me").

- The decision to take additional, non-major courses at a private college/university to supplement higher education curriculum (code correlates to question #19: "Did you take any additional courses [in a different field] at a private college/university [other than your assigned campus] as an undergraduate student?").

- Perception that the hard-sciences are the most intellectually challenging (code correlates to Likert question #23: "Science/technology are more rigorous fields than the social sciences/law."

- Commitment to mastering course content, as opposed to memorizing information for the sake of high grades in college (code correlates to Likert scale question #24: "In university lecture courses, I cared more about understanding the material than I cared about getting high marks").

- The dearth of practical knowledge in universities (code correlates to Likert scale question #26: "In university lecture courses, I learned practical skills about my discipline").

- The inadequacy of undergraduate laboratories (code correlates to Likert scale question #27: "I learned a lot of information from lab courses").

- Lack of professional opportunities for university graduates (code correlates to question #33: "Are you in the same field as what you studied in university?" and Likert scale question #39: "There are many opportunities for recent university graduates in my field").

- The importance of developing entrepreneurship skills before entering the job market (code correlates to Likert scale question #43: People who study science/technology should also take business/entrepreneurship courses").

Thus, to maintain fidelity to the interviewee experience, it was necessary to incorporate their common responses into the design of the survey. Ultimately, this integration led to a more refined and accurate quantitative instrument (O'Cathain, Murphy, & Nicholl, 2010).

Quantitative Methodology

Historically, quantitative research has been built on the premise that facts exist in an objective reality (Firestone, 1987). Quantitative research is generally perceived as more rigorous and less likely to be impacted by researcher bias and subjectivity (Winter, 2000) due to its emphasis on numeric and technical measurements. However, like qualitative research, quantitative research can be affected by the assumptions and lived experiences of the researchers. Additionally, it can also be used to advance a distinct political agenda (Gillborn, 2010) because it is designed and carried out by inherently subjective individuals. As a researcher with a critical epistemology, I recognize the need for best practices that promote social justice in quantitative scholarship. In discussing this type of empirical research, Cokley and Awad (2013) recommend that social-justice focused quantitative studies should: 1) involve study participants in the research process, 2) carry out pilot testing, 3) avoid comparisons that normalize one group, and depict other groups as deviant, and 4) utilize proximal variables (that reflect the lived experiences of participants) in research. In keeping with the recommendations from Cokley and Awad

(2013), the quantitative data collection of this study was participant focused and participant-led in design.

Survey approach. In this study, I utilized a quantitative survey to collect information about predictors (Creswell, 2002) of educational success. Surveys are a useful type of quantitative tool because they allow researchers to generalize claims about a population. Barlett, Kotrlik, and Higgins (2001) explain, "a common goal of survey research is to collect data representative of a population…findings from a drawn sample [are used to generalize] back to a population, within the limits of random error" (p. 43). Moreover, since surveys can be administered in the same format and delivered to every respondent in the same way, they are a useful research tool for isolating a particular phenomenon (Fowler, 1995). Ideal surveys are both valid (individual survey questions measure the phenomenon they are supposed to measure) and reliable (individual survey questions yield consistent answers in comparable situations) for every item (Couper, 2008).

Instrument. The survey instrument designed for this study had 50 items. Of the 50 items, 30 items are based on a 5-point Likert scale, while the remaining 20 questions are a combination of dichotomous, multiple response, and fill-in-the blank. The instrument was divided into four sections titled: Family and Secondary Education Background; Higher Education Experiences, Career Goals and Life after University; and Demographic Information. A summary of the content of the construct sections are provide in the following table.

Construct Section	Content
Family and Secondary Education Background	Education level of parents and siblings Type of secondary school attended Religious orientation Socioeconomic class background Performance on 10th and 12th grade leaving examinations
Higher Education Experiences	English fluency First year transition into university life Satisfaction with lecture and laboratory courses Utility of campus gender office Participation in co-curricular internships
Career Goals and Life after University	Employment experience Relationship with female mentors and mentees Preferred city/country of residence after graduation Plans for graduate education Relevance of entrepreneurship in post-college career
Demographic Information	Place of birth Undergraduate institution and major Undergraduate GPA

Table 3. Construct Areas for Survey Instrument

Structurally, I used the amended circles of progression framework from Jama et al.

(2008) to organize the first three sections. However, the individual items were shaped by

emergent themes from the qualitative interviews. The introduction to the survey served as

an informed consent agreement for each respondent. The complete survey is available in

Appendix M.

   Sample. For the quantitative phase of this study, a total of 204 respondents filled

out the quantitative survey. Originally, a total of 214 respondents took the survey.

However, four respondents did not study science or technology (two studied

management, one studied English, and another majored in law) so their data was

withdrawn from the sample. Furthermore, six other respondents attended private higher

education institutions (including Jimma Agricultural College, Central University College,

Atlas College of Health sciences, Medco College, Africa Medical College, and Royal College) so their responses were also removed. After this data cleaning, 204 valid responses remained.

Higher education institutions from across the country are represented in the sample, most frequently: the different campuses of Addis Ababa University (n=86), Mekelle University (n=16), Bahir Dar University (n=11), Jimma University (n=6), Gondar University (n=6), and Hawassa University (n=5). Engineering was the most popular major, with 35.29% of respondents saying they majored in this field, including: civil engineering (n=27), computer and electrical engineering (n=10), electrical engineering (n=9), chemical engineering (n=6), software engineering (n=4), industrial engineering (n=3), biomedical engineering (n=3), food process and food technology engineering (n=3), civil and environmental engineering (n=2), mechanical engineering (n=2), computer science and engineering (n=1), hydraulics engineering (n=1), and unspecified engineering (n=1). Other popular disciplines include: chemistry (n=16), computer science (n=14), and physics (n=7). The average GPA of respondents was 2.98 and ranged from 2.64 to 4.00 points. A small proportion of respondents (21.6%, pursued or are planning to pursue a Master's degree immediately after obtaining their B.S. degree. While half of all participants (50%), stayed/planned to stay in the same city as their alma mater, nearly all (80.7%) participants considered graduate education outside of Ethiopia. Additionally, many respondents (58.8%) were also interested in working professionally outside of Ethiopia, most often in the United States, Canada, and Europe.

In terms of personal background, 49.5% of respondents said that they had at least one university-educated parent while 69.6 % aid that they had at least one university-educated sibling. Religiously, most women in this sample were Orthodox Christian (67.6%), while 19.6% were Protestant Christian, 7.8% were Muslim, and 4.9 % selected "Other." Among those who selected "Other" for their religious background, those who elaborated often described themselves as Roman Catholic, Bahai, and Atheist. When describing their family's economic class, approximately half (50.5%) identified as middle class, while 27.5% considered themselves lower class and 22.1% thought of themselves as upper class. The age of respondents ranged between 20 to 49 years old.

Procedure for data collection and analysis. For the quantitative portion of the study, I recruited participants using multiple strategies. First, I contacted potential respondents using a recruitment email (Appendix B) that I sent to colleagues, friends, and interviewees from the first phase of this study. I asked these individuals to share a Qualtrics survey with people that fit the following criteria:

- Be an undergraduate student in their final year or recent alumni of one of the 33 public universities in Ethiopia

- Identify as a woman

- Currently reside in Ethiopia

Some of the key colleagues that I relied on to share my survey included Dr. Tesfaye Semela (my in-country field supervisor), Dr. Berhanu Assefa (who helped me recruit interviewees for phase 1 of the research, and many of their colleagues at Bahir Dar University, Mekelle University, and Jimma University. In relying on these academics to

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help me share this survey, I recognized their positions as institutional gate-keepers (MacDougall & Fudge, 2001) that have credibility among the target population. Additionally, by asking former interview participants to share the survey, I used a snowball sampling technique (Browne, 2005). Compared to probability sampling strategies (such as random and stratified) that reflect a larger population, the use of a snowball sampling technique limited the generalizability of the survey results (B. Sommer, 2011). Nevertheless, snowball sampling was a useful strategy for recruitment when the population of eligible women is relatively small (Browne, 2005). Since the proportion of women who major in a science or technology discipline at a public university is relatively small (Kelemu, 2013), I relied on the social networks that exist between women to reach study participants who would otherwise be difficult to find.

Furthermore, I used social media sites to increase the number of survey respondents. For example, I recruited participants through Addis Insight, an online media company based in Ethiopia. After communicating with a representative from this organization, I found out that they have a substantial social media presence. For instance, the Addis Insight LinkedIn page has over 115 thousand followers. Because of their wide reach, I decided to buy ad space on their official Facebook and LinkedIn pages to advertise my survey for 19 days (from December 13-31, 2017). While the exact impact of the ad cannot be isolated (there was no item on the survey that asked how each respondent found out about it), I did notice a sizable spike in the number of respondents during the time window that the ad was active (December 13-31, 2017). A photo of the Addis Insight ad and a summary of the survey responses (by date) are available in

Appendix N and O, respectively. The use of Twitter, another social media platform, was also an instrumental strategy in participant recruitment. Using this site, I created a post in which I asked my Twitter network to share my survey with people they know. Within the span of a few days, over 900 people engaged with this post (by viewing it, clicking on the link, or sharing it). A summary of the reach of the tweet is included below.
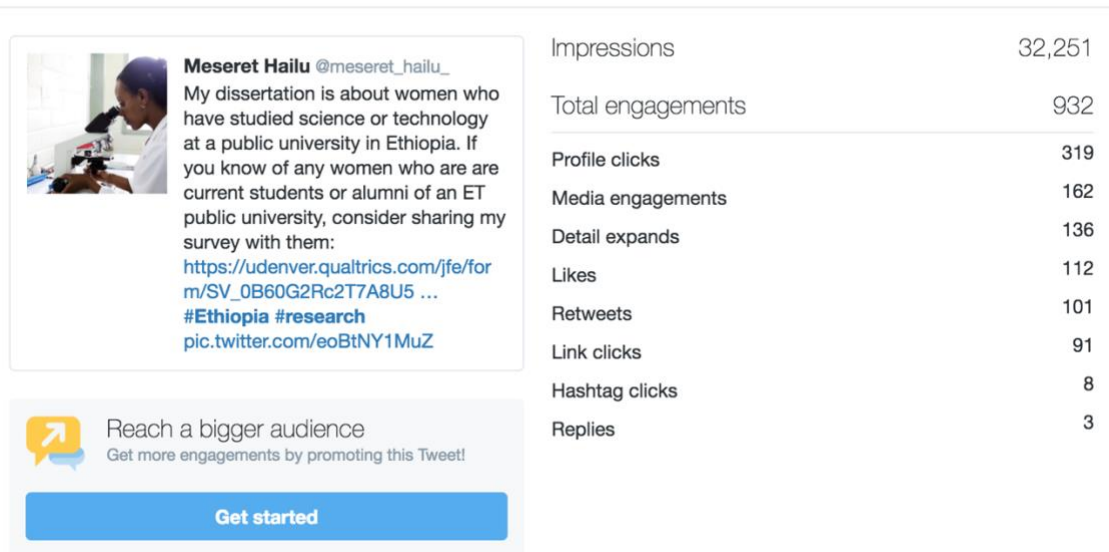
Figure 4. Twitter Analytics Based on Survey Recruitment Post

The final method I used to recruit participants was hiring and managing research assistants. In January 2018, I was introduced to two employees of a private, monitoring and evaluating agency in Addis Ababa. After meeting with them and learning that they were seasoned researchers, I provided 50 paper copies of the study survey. These researchers then went to the CNS and INS campus of Addis Ababa University to administer the survey in person. Because these research assistants have local government IDs and are alumni of AAU, they had relatively easy access into campus. Additionally, they spoke fluent Amharic and had credibility among respondents as local Ethiopians.

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These hired assistants recruited 50 survey respondents within two days. To compensate

them for their work, I paid each research assistant 600 ETB. After they gave me the paper

copies of the survey, I manually entered responses into Qualtrics.

Data analysis. After responses from the quantitative survey were recorded, the

first step in analysis was data cleaning. The process of data cleaning (frequently called

data scrubbing) ensured that the acquired data was free of invalid responses (Rahm & Do,

2000). For this survey, data cleaning involved removing blank survey responses

(occasionally, respondents would click through the entire survey without answering a

question, and then submit the form); and removing response from survey takers who did

not meet the eligibility criteria (like graduates of private colleges or women who did not

study a science or technology major).

Next, I performed psychometric analysis of the survey instrument once the full

dataset was collected. I reviewed all responses from participants, and checked to see if

the completed surveys reflected reliability and validity—including face, criterion-related,

and construct (Ivankova & Stick, 2007). Reliability is an indicator of how a survey item

consistently yields similar results, even when presented to different individuals or in

different settings. Since this instrument was distributed nationally, respondents came

from a variety of university settings (more than 20 universities are represented). Validity,

meanwhile, is an indicator of how well a survey item evaluates the phenomenon it is

intended to evaluate (Thayer-Hart, Dykema, Elver, Schaeffer, & Stevenson, 2010). For a

survey instrument to be robust, survey items must reflect face validity (questions must

appear appropriate to respondents at first read), criterion related validity (the extent to

which questions are consistent with older, more reputable surveys that measure similar phenomena), and construct validity (questions must appropriately measure a desired attribute) (Allen & Yen, 2001; Dean, 1996). Finally, I analyzed the data through descriptive statistics, a Chi Square analysis, and multiple linear regression (in which the outcome variable is college GPA), using IBM SPSS statistical software (Peng, Lee, & Ingersoll, 2002).

Descriptive statistics. Since the survey instrumented aimed to gather information regarding the characteristics of a student group, descriptive statistics were an important element of data analysis. After scrubbing the data, I used SPSS to determine the frequencies of demographic data (i.e. how many respondents attended Mekelle University, majored in Chemical Engineering, have at least one university-educated parent, etc.) I also used SPSS software to determine the mean, or average (Hoffmann, 2018) for continuous data, like respondents' age and undergraduate GPA.

With the assistance of an external consultant who specializes in geographic information systems (primarily ArcGIS), I also created three sets of maps that display the geographic distribution of respondents', undergraduate universities, birthplaces, and an overlay of these two constructs (available in Appendices P, Q, and R, respectively).

Chi square analysis. After getting a thorough understanding of the descriptive analyses, I used chi square tests to compare different groups within the data set. I decided to complete this parametric test in order to identify trends within the heterogeneous group of survey respondents. A chi square test is useful for determining groups of whether categorical variables differ significantly from one another (Eck, 2018). Each category

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must have more than 5 or more values in order for this type of analysis to work (Fisher & Yates, 1963). Since the survey had 11 items with dichotomous (yes/no) answer options (questions number 2, 3, 8, 9, 10, 11, 12, 15, 16, 17, and 18), I selected responses from these questions to create the groups to needed complete a chi square test. Using SPSS, I then compared respondents' answers to Likert-scale questions. For instance, question 12 asks, "Did you participate in an internship while you were an undergraduate student?" Two groups of students were compared for this item: those who interned (Group 1) and those who did not intern (Group 2). Next, I compared these two groups to determine if there was a significant difference in how they responded to 30 Likert-scale questions. Finally, the outcome value for each test was then assessed for statistical significance using a p-value of 0.05. Using this information, I assessed trends in participants' demographic information.

Multiple linear regression. Additionally, I completed a multiple linear regression analysis using IBM SPSS Statistics software for Mac (IBM, 2017). Historically, regression analyses are used to identify a predictor for an outcome. In this study, the main outcome being investigated was graduation (which has a dichotomous, "yes" or "no" outcome). However, since all participants who opted into the study had persisted to graduation, a regression based on persistence was not appropriate. Recognizing this after all data collection had been completed; I instead choose to do a regression based on undergraduate GPA. While this outcome measure is not synonymous to undergraduate persistence, it was a useful measure to use in this regression because it provided insight on student performance. Additionally, this regression offered allowed

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me to engage in complex parametric analysis that could tease out patterns in the data from survey respondents. I am operating from the perspective that the higher a student's GPA, the more successful she has been in navigating barriers to persistence.

According to Schüppert (2009), a multiple linear regression involves more than one, predictor variables (the independent variables); and one outcome variable (the dependent variable). Before creating regression models in SPSS, I re-coded all predictor variables into phrases that would be read by the software. For instance, I recoded responses from yes/no demographic questions into variables that were coded as "1" and "2" in the data file. After "transforming" (or re-coding) this type of data, I used a stepwise regression process to find the linear regression model with the highest significance values (for each predictor variable). Stepwise regression requires that predictor variables be systematically added or removed until the regression with the highest significance values is generated (Montgomery, Peck, & Vining, 2012). In this study, the best regression model involved three, individual predictor variables. The independent variables were categorical and ordinal data points. The outcome variable was GPA, which is continuous. Finally, I confirmed that the following assumptions (StatisticsSolutions, 2018) after generating the regression model:

- linearity (a linear relationship between the predictor and outcome variables),

- normality (a normal distribution of residuals),

- no multicollinearity (independent variables are not highly correlated with one another), and

- homoscedasticity (all independent variables have similar variance of error terms).

Second Stage of Interface

As an exploratory mixed-methods study, quantitative data collection and analysis took place after the qualitative phase was complete. The second stage of interface for this work happened when the different sources of data were integrated. According to R. B. Johnson and Onwuegbuzie (2004), data integration is the process by which all data types are merged together or presented as two separate coherent sets. I chose to integrate all data into a coherent, whole set because it allows for a more holistic understanding of the student population being studied. I compared how responses from the survey added to (or in certain cases, contradicted) the themes from interviews. When drawing conclusions, I drew from both types of data and presented overarching themes. In doing so, I arrived at analytic density, or "richness" (Fielding, 2012) regarding the details and scope of participant experiences.

Researcher Positionality

Growing up in the United States as a first-generation Black immigrant woman, I often clung to my Ethiopian heritage to help me combat the racism and xenophobia I experienced in school settings. As I grew older and pursued a Bachelor's of Science degree (in Biology and Chemistry) and a Master's of Science degree (in Biomedical Sciences), my positive ethnic identity became an even more important shield against the feelings of isolation I felt in academic science. As a doctoral student examining the experiences of Ethiopian women in undergraduate science and technology programs, I

recognize the convergence of my personal experiences and academic goals. Like many

women of color in academia, I completed research within my own community with the

hope of empowering and fortifying that community. The sentiments of postcolonial

feminist scholar Chandra Mohanty (2003) resonated with me, as she explains the

rationale for her own scholarship:

> I was determined to make an intervention in this space in order to create a
> location for Third World, immigrant, and other marginalized scholars like myself
> who saw themselves erased or misrepresented within the dominant Euro-
> American feminist scholarship and their communities. (p. 503)

Thus, these multiple components of my identity and life influenced my researcher

positionality.

In many ways, the identities I shared with my study's participants helped me work

as a more credible researcher. As a woman who also studied science during my

undergraduate career, I shared a sense of camaraderie with the female students in my

study who have navigated gendered classrooms, laboratories, and research experiences.

As an Ethiopian national born to Ethiopian parents, I also have a name and ethnic identity

that my study participants recognized. At the same time, I was different from my

participants in ways that might have made them uncomfortable. As a United States

naturalized citizen raised abroad, my political and social worldview is shaped by

American values and culture. Thus, my assumptions about gendered interactions, ways of

communicating, and expectations for campus climate may be oppositional to those of the

women I interact with. Being American also means that I am (presumably) wealthier than

most of the individuals included in the research study, which may result in study

participants feeling like I hold power over them. My position as a Fulbright-Hays Fellow

also presents potential challenges in working with the study population. Since the Fulbright program has supported American researchers in Ethiopia for many years, individuals in my study may have had a negative experience with a Fellow in the past. If that was the case, participants may have been hesitant to share information or be suspicious of my intent.

Recognizing these distinct aspects of my position as a researcher, I took steps to ensure study participants feel as autonomous and comfortable as possible. Their choice in participating in the research study was constantly reinforced, and they were assured that any information shared would remain confidential. I also relied on what I have in common with study participants to mitigate the socio-cultural distance between us.

Finally, I demonstrated an awareness of my political privilege (as an American citizen) by how I choose to ask questions about the experiences of my study participants. Ethiopia is an authoritarian state and the federal government regularly carries out extensive surveillance of citizens (Freytas-Tamura, 2017). Because of this surveillance, it is unsafe to publicly criticize the ruling political party (the EPRDF) or the policies enacted by this group. Knowing this, I steered clear of any questions that would require that my participants divulge their opinions, frustrations, and experiences with the government, contentious government policies, or the current political climate. In doing so, I sacrificed some richness in data that would have emerged had my participants contextualized their experiences through sociopolitical events. This insight would have been particularly valuable since all of my participants attended public institutions that are directly controlled by the federal government. Instead, I couched participant responses

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and narratives within literature about Ethiopian political history. Ultimately, I believe this was a necessary methodological decision that I needed to make to protect study participants from potential harm.

Assessing Credibility of Data

The qualitative phase of the research was made credible through a commitment to trustworthiness. Trustworthiness is possible when the findings of a study reflect the experiences of participants (Lincoln & Guba, 1985). To ensure that the study is trustworthy, I practiced "bracketing" by being reflexive about my own biases with regards to study topic and set aside my own assumptions about what women's educational experiences should be (Fischer, 2009). I also practiced triangulation, by incorporating non-participant observations and documents (Kimchi, Polivka, & Stevenson, 1991) shared with me during the interviews into qualitative data analysis.

The quantitative portion of the research was legitimated using a pilot study, which allowed me to assess readability. Once the survey instrument was constructed, I distributed the survey to three individuals who tested the instrument for functionality. When reviewing responses to this pilot study, I assessed the survey instrument to ensure that I avoided common mistakes in survey design, including: providing insufficient or excessive response options, presenting items as statements instead of questions, utilizing double-barreled items, and writing negatively worded items (Artino Jr, Gehlbach, & Durning, 2011). Additionally, I also checked each set of Likert scale questions (there were 30 Likert scale questions total) for internal consistency by computing a Cronbach's alpha. The statistic measured in called an alpha coefficient and provides information

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about a scale's reliability. A coefficient that is 0.70 or higher ($\alpha \geq .70$) is considered acceptable, and shows that the items in the scale are closely related (Bland & Altman, 1997).

Ethical Considerations

As a researcher, I foregrounded two principles of ethics in my study: the autonomy of study participants and a consideration of the vulnerability of the population of interest. At every stage of the study, I respected the autonomy of study participants, and communicated to them that they may refuse to participate (or withdraw after starting) without any penalty or consequence (Orb, Eisenhauer, & Wynaden, 2001). Additionally, I prioritized the autonomy of study participants by providing them with a written statement of consent (Steinar, 1996) at the beginning of each stage of data collection (both qualitative and quantitative) that outlined the scope of the study and their freedom to disengage at any time.

Another component of the ethical research involves considering the vulnerability of study participants (Miracle, 2010; Sutton, Erlen, Glad, & Siminoff, 2003). In this work, I am interviewing adult women about their positive educative experiences. No treatments or intervention programs were used, and the anonymity of participants (Ivankova & Stick, 2007) was maintained at all times. As a result, this study has minimal risk (Kopelman, 2004). In accordance with the institutional policy at the University of Denver, this study was vetted through the Institutional Review Board process, under the expedited review protocol.

Limitations of the Study

While this research study has several benefits, it is also subject to numerous limitations. As with any mixed methods design, a challenge for the completion of this work was its length (Ivankova & Stick, 2007). The incorporation of multiple study sites, multiple data collection methods, and various stages of analysis made the task of completing this study arduous. The reliance on internet access in the second phase of research was especially difficult because internet penetration in Ethiopia is about 11.6% (WorldBank, 2016), meaning that the majority of Ethiopian residents do not have access to consistent wireless internet. Thus, reaching the target number of survey respondents was difficult.

The generalizability of the data that was collected in the qualitative portion of this study is also limited. For the qualitative phase of the study, all three universities selected are in urban centers, enjoy prestigious reputations, and are relatively well funded (AAU, 2015; Ayele, 2013; Bachore, 2016; Kelemu, 2013; Mohamedbhai, 2011). The undergraduate students I recruited for the first phase of the study did not necessarily have experiences that reflect those of Ethiopian women writ large. The generalizability of the quantitative survey was also compromised by the use of an opt-in survey. Although I incorporated an informed consent portion in the Qualtrics survey (that asked potential respondents to take the survey *only* if they met the study criteria), anyone with the online link could have completed the survey. Since all survey responses were anonymous, there was no way of following up with individual participants to verify collected data or clarify when survey responses were ambiguous. This was a limitation of the study because there

was no way to verify whether people's responses are true or based on actual, lived experiences that can be applied to a broader population. Moreover, having the survey on an online platform itself limited generalizability because it potentially correlated to a certain class of respondents with stable internet connection.

Lastly, this study was limited because it did not account for the experiences of women who had *not* persisted to graduation in Ethiopian higher education. Lavrakas (2008) argues that baseline or control groups are needed in research if the investigator is claiming causal effects. While this research study did not examine causality specifically, it did aim to identify traits among a certain group of people that could be used for future predictions or program development. However, all the people who participated in different phases of this study have attained the outcome measure that was investigated (persistence to graduation). While retroactive analysis has been completed and I have tried to identify commonalities among all respondents, I recognize that these traits may not have been what helped women persist. Since there were no negative (or control) cases to compare participants' traits to, I cannot definitively state that the commonalities I observed among participants are the traits of *all* women who persist in public universities.

Chapter 4: Discussion of Findings

The purpose of this study was to interrogate the experiences of women who have studied science and technology at public universities in Ethiopia. The work was guided by the following central research question: what factors help women persist in undergraduate science and technology majors at public universities in Ethiopia? I also referred to four sub-questions:

1.) How do participants describe their everyday, lived experiences as women in science and technology?

2.) What aspects of campus life help women succeed in these disciplines?

3.) How do women seek out and find institutional and social support at the various stages of their education?

4.) How does the "Circles of Progression Model" (Jama et al., 2008) help us conceptualize women's success in public higher education?

In this chapter, I present the findings that emerged from this investigation. This was a study based on the exploratory sequential paradigm, and therefore, the qualitative data was more important. As a result, in presenting the findings of this work, the qualitative data collection and analysis have priority status. Quantitative data were used to supplement, extend, and nuance the information gleaned from participant interviews. Findings are also integrated, meaning that quantitative and qualitative results are

presented together. By using both types of data to paint a more complete picture of this student population, I hope to address a gap in the literature about this subset of Ethiopian students. Lastly, this findings chapter presents a descriptive summary of student attributes, and the correlations that exist between them. Because this work was done retroactively (meaning, I asked students about their experiences in education once they had completed most or all their undergraduate education), it does not provide causal or predictive information.

Summary of Qualitative Themes and Quantitative Statistics

In this chapter, I present the six main themes that emerged during data analysis of participant interviews, along with direct quotes from participants that support these themes. A total of 237 open codes emerged during data analysis in Nvivo, which I then organized into 12 nodes, summarized in the figure below (also available in Appendix V):
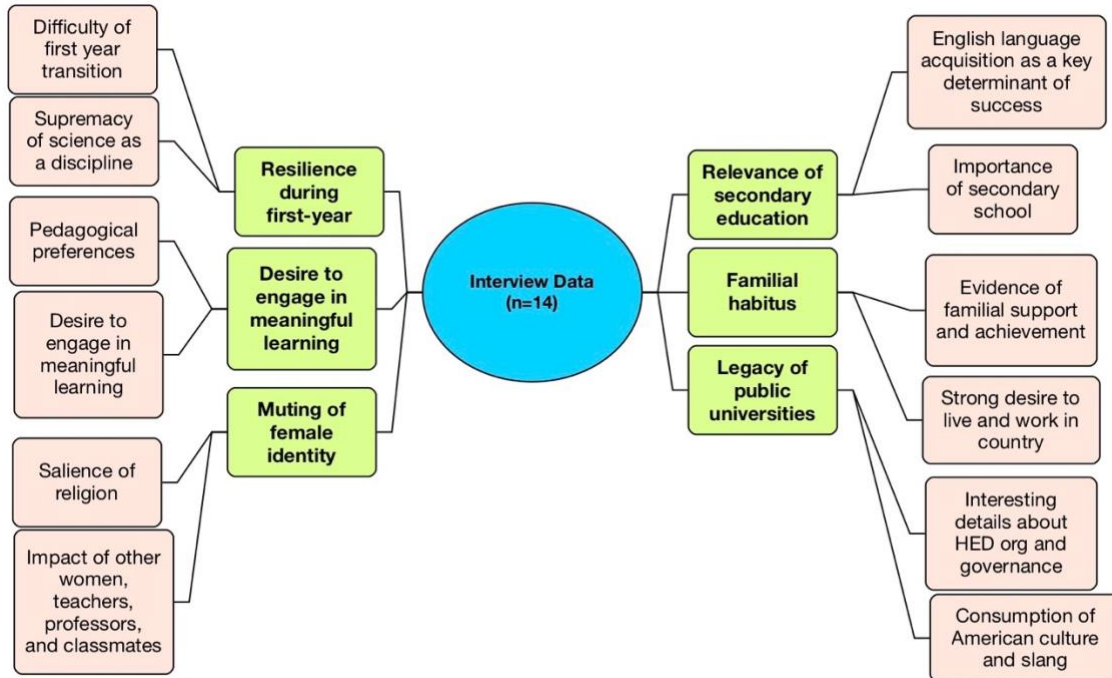
Figure 5. Visual Summary of Codes from Nvivo

From those original codes and nodes, I developed the following themes:

- Resilience and Agency during First Year Transition

- Desire to Engage in Meaningful Learning

- Silencing of Female Identity

- Relevance of Secondary Education

- Familial Habitus

- Legacy of Urban Public Universities

These themes were then collapsed into two major categories: the Internal Factors that are Related to Persistence and the External Factors that are Related to Persistence. The first category includes dimensions of each woman's personal life and schooling that helped propel her into her academic discipline. Oftentimes, these attributes relate to the socio-economic background of each participant. The second category includes aspects of

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educational institutions and other organizations that helped women access academic opportunities. To provide greater context about the themes that emerged, I also draw from the two composite narratives about study participants (see Chapter 3) that help demonstrate the demographic trends that were present among interviewees.

Furthermore, I augment the qualitative themes using the results of three parametric statistical tests: Chi Square analysis, bivariate correlations, and a multiple linear regression. To accomplish this, I first ran a Chi Square test of independence by creating a cross tab for the 11 questions on the survey with a dichotomous response option (considered the independent, categorical variables) and the 30 Likert scale questions. To ensure that the Likert scale items had internal consistency, Cronbach's Alpha was calculated ($\alpha=.729$) for the 30 Likert-scale items. This action resulted in 330 tests of association. After examining each association, I assessed each output table to determine whether the assumption for expected cell count was met. This assumption must be met because expected values need to reflect the unbiased distribution of cases (if the categorical variable has no effect) and the incidence of cases (McHugh, 2013). I discarded 240 tests of association because they had at least one cell with an expected count less than 5. After this cleaning, 90 tests of associations remained. From these, only nine had a Pearson Chi-Square value with a corresponding p-value that was statistically significant ($p \leq 0.05$).

Next, I ran bivariate (Pearson) correlations for all associations that proved to have significant Chi square values. The correlation tests were used as confirmatory tests and they yielded five significant correlations. All values for these parametric tests (and their

corresponding significance values) can be found in Table 4 below. Bonferroni type

adjustments were not made for any of p-values from the Chi square tests or from the

bivariate correlation tests. Perneger (1998) posits that these adjustments are not necessary

if the researcher explains which statistical tests were done and the rationale for each. All

Chi Square test tables (with cross tabulations that meet the expected value assumptions)

are available in Appendix S. All bivariate correlation test tables are available in Appendix

X.

Comparison of Demographic (Dichotomous) vs. Likert Scale Question*	X^2 Test Statistic	X^2 Significance Level	Pearson Correlation Coefficient	Pearson Correlation Coefficient Sig. Level
Desire to stay in the same city as university [Q15] and use of gender office [Q13_9]	9.624	.047	-.135	.089
Fluency in English [Q8] and adequacy of course materials in high school [Q7_4].	14.991	.005	-.224	.003
University education of parents [Q2] and feeling like you have people to talk to about science/tech careers [Q7_3].	14.797	.005	-.233	.001
University education of parents [Q2] and adequacy of course materials in high school [Q7_4].	11.364	.023	-.221**	.002
University education of parents [Q2] and feeling prepared for university classes [Q7_10].	15.252	.004	-.264	.000
University education of siblings [Q3] and adequacy of course materials in high school [Q7_4].	13.094	.011	-.112	.114

University education of siblings [Q3] and satisfaction with lab courses [Q13_7].	12.823	.012	-.125	.096
Desire to stay in the same city as university [Q15] and adequacy of course materials in high school [Q7_4].	10.333	.035	-.205	.009
Desire to working outside of Ethiopia [Q18] and perception of learning practical skills in undergraduate major [Q13_6].	11.423	.022	.089	.089

Table 4. Summary of Values for Chi Square Test of Associations and Correlation Coefficients. "Q" indicates Question number from study survey.

Additionally, I present a multi-step, linear regression model with three predictor variables for GPA. Participants' predicted GPA is equal to $3.619 - 0.070$ (DIFFICULTY) $- 0.189$(CHOICE) $- 0.017$(SATISFACTION). The predictor variables were:

1. Perception of difficulty of their first year (measured by the Likert-scale prompt, "My first year was difficult"), which had a p-value of 0.010.

2. Alignment between assigned discipline with personal preference (measured by the dichotomous question, "As a university student, was your assigned discipline your first choice?"), which had a p-value of 0.011.

3. Overall satisfaction with college major (measured by the Likert scale prompt, "when I look back at my undergraduate education, I wish I had studied something else"), which had a p-value of 0.049.

While the Circles of Progression proved to be useful tool for examining existing literature, the themes and statistics from the data did not neatly fit into the categories of this framework.

Internal Factors Related to Persistence

Overall, when describing their education journeys, interviewees talked about their academic achievement as a normal, expected part of their life. Despite the major gender disparities that exist in higher education, participants did not see their individual persistence as an unlikely outcome. In these descriptions provided by interviewees, internal notions of agency and resilience, a desire to engage in meaningful learning, and the silencing of female (read as "minority") came up. For example, during interviews, most women talked about a university education as an expected part of their lives, a milestone that they knew they would ultimately reach. Perhaps this tendency to see higher education as inevitable is a result of having academic achievement modeled for this student population. Nearly half (49.5%) of survey respondents had at least one university-educated parent, and 69.6% of participants noted that they had at least one university-educated sibling. Participants also tended to exhibit high expectations for their own intellectual ability. This positive outlook is remarkable, considering that participants have navigated a schooling system that generally does not affirm women's capacity for inquiry. Yosso (2005) theorizes that marginalized communities often have familial, aspirational, and navigational capital that often goes unacknowledged by the dominant culture. In the case of this study, participants' belief in their own ability to succeed is a byproduct of the familial, aspirational, and navigational advantages they accessed.

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Additionally, participants' determination to access and persist in higher education was captured in the agency and resilience they displayed during their first year in university, as well as their desire to engage in meaningful learning. When asked to indicate their level of agreement with the statement, "My first (freshman) year was difficult," 57.5 % of survey respondents selected "Agree" or "Strongly Agree." Notwithstanding this difficulty, they managed to make it to their final year. Most participants were also reluctant to acknowledge their female identity, especially if their status as a woman jeopardized their credibility as ad capable student who demonstrated that she is invested in mastering course content.

Theme 1: Agency and resilience during first-year transition. Study participants encountered a multitude of challenges when they arrived to campus as first-year university students. In response to this, they exhibited *agency*—that is, a sense of autonomy and control over the learning environment (Sawyer, Smith, Rowe, Azevedo, & Lester, 2017); and *resilience*—that is, sustained motivation in the face of adversity (Tempski et al., 2015). Issues such as overcrowded dormitories (noted by Eskedar and Tiya, during Interview 2), overwhelming course material in classes (mentioned by Nardos and Selam, Interview 2), and haphazard campus administration (pointed out by Abigail and Sewit, Interview 2), frustrated the women in this study. Quantitative evidence also suggests that a sense of choice might not have influenced the difficulty of this transition. In Ethiopia, the Ministry of Education dictates which campus a public university students attends (Tessema, 2009). Survey results show that there was not a significant difference in perception of first year difficulty between students who were

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assigned their first-choice campus, and those who were assigned to a public university that was not their first choice. As demonstrated by the test of association #41 (Chi-square= .332, p>0.05, *df*=4; available in Appendix S), there was not a significant association between people's response to the question: "As a university student, was your assigned campus your first choice?" (the categorical variable) and their Likert-scale responses to the statement "My first year was difficult." This is evident because the listed p-value is greater than the chosen level of significance (.988 > 0.05). The insignificance of this association implies that women consistently encountered common challenges, across different campuses throughout the nation.

For many of the female peers who attended the same schools as the study interviewees, these obstacles were insurmountable. Sewit mentioned that in her first-year cohort at Bahir Dar University, only 80/200 women were still enrolled at the end of the academic year. This interviewee, who came from an all-girls high school, explained how she found it difficult to deal with the gendered assumptions made about her intellectual abilities in her university's predominantly male classrooms. During our second interview, she recalled an anecdote from her first year that encapsulated some of the challenges she faced:

> So the power dynamics is very strong, and I think – and you can feel like
> everyone is expecting you to fail. I asked a question in class the first day, and
> everyone just surprised that a girl asked a question.

Sewit and other privileged interviewees exhibited notable agency, compared to their female peers, and this helped them complete their first year in college. To this end, Yeshi (during Interview 2), explained:

> So when we got there the first thing was you needed to learn how to – not support yourself, but how to mind your money and stuff, manage your food. Right? So manage everything for yourself. That was pretty challenging. School-wise, like we discussed last time, the amount of courses or the subject content you need to cover was so much. So like you going to the class and then the teacher write something on the board. And then no one tells you need to go and refer a book, like I don't know, like a thousand pages. Everyone goes through it, I mean. But no one prepares you for that.

In this excerpt, Yeshi explained how she learned how to manage her time, finances, and study habits to make it to the end of her first year. The unwritten rules of the academic environment (such as having to refer to a book that the professor had not explicitly mentioned), were aspects of the first-year transition that students like Yeshi could master relatively quickly. Other participants might have relied on their first-year orientation as a resource for maneuvering the academic pitfalls. According to survey responses, 52.8% of participants said "Agree" or "Strongly Agree" when posed with the statement, "Freshman orientation was helpful." This trend is consistent with the scholarship of Prasad, Showler, Ryan, Schmitt, and Nye (2017) and ye Kim, Ghosh, Young, Santana, and Opelt (2017), who argue that first year orientation is an opportunity to support and retain minority students in higher education.

In addition to navigating the academic challenges during their first year, participants demonstrated agency by figuring out ways to overcome social barriers. Since final decisions about university enrollment are made at a federal level (Tessema, 2009), students from all over the country come together for public higher education. While this mechanism for enrollment generates compositional diversity (along the lines of geography, class, and ethnicity), such a rigid strategy for bringing students together also presents challenges. Eskedar, in Interview 3, explains:

Also, I mean, it's exciting to meet a lot of people, but it's also difficult to communicate with all of them and to agree with them with lots of idea. So as much as it's exciting, it's also difficult.

Similarly, Melat articulated the social dissonance that women encounter when they get to campus. During interview 3, she explained what she observed among other students, as she said:

It was better to have a female mentor maybe because they have more experience than us, especially when we are fresh, we are new for the campus. We don't know what to do when we were freshman students. We have no idea what to do. We have no idea of how to study. So we were forced to ask the seniors students. So if they were a mentor, senior students or if a mentor teachers, that might make that time better, especially – I was successful but it might not – that didn't bring difference in my life but it might help as a womans who couldn't achieve what they dream of so it was better, yeah.

While Melat recognized the need for institutional mentors to help other women advance in their education, she expressed that she circumvented such barriers without external support. As a student who did not come from a particularly privileged background, her ability to figure out how to persist shows that she developed her own, internal resilience strategies. Overall, the experiences of interviewees like Eskedar and Melat are consistent with the larger pool of study participants. When asked to answer their level of agreement with the statement "My first year (freshman year) was difficult," nearly 60% of survey respondents answered "Agree" or "Strongly Agree." Conversely, most survey respondents (54%) answered "Disagree" or "Strongly Disagree" in response to the statement "I used the services of the gender office," which signals that study participants are using non-conventional strategies to persist. Instead, participants might have relied on interpersonal relationships, advice from educated family members, and their own ambitions to help them develop strategies for staying enrolled.

The experiences of Melat, Eskedar, and other numerous survey respondents suggests that making it through the first year of college is a formidable challenge for female students. Melat's astute observation regarding mentorship suggests that for most women, mentorship from older, same-gender peers and female faculty would help them succeed. This observation is consistent with scholarship from many higher education scholars. For instance, Museus and Quaye (2009) explain that cultural dissonance often has a negative impact on (racial) minority student persistence. Comparatively, for women in Ethiopian public higher education, the culture shock they experience once they arrive on campus might exacerbate the difficulty of their integration into the institution. Thus,

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the ability of study participants to figure out ways to overcome these academic and social challenges is an illustration of their agency and resilience. The lived experiences of survey participants, however, challenge popular notions about *how* minority students overcome academic and social challenges during freshman year. The tendency of students, like Eskedar and Melat, to reconcile the cultural and social dissonance of their first year largely without the help of formal female mentorship, the services of the gender office, and other conventional support systems for female students is worth noting. Altogether, their distinct ways of demonstrating resilience and agency—which includes freshman orientation and drawing form their own aspirational capital—complicates traditional notions of female student support. With this new insight, higher education institutions should reconsider how student affairs programming for women is designed and implemented.

Theme 2: Desire to engage in meaningful learning. Although most interviewees were high-achieving students in terms of GPA, they seemed motivated more by a desire to engage in meaningful learning, rather than high grades. For instance, they frequently talked about the desire for practical experiences to supplement the theoretical information they learned in classrooms. While higher education institutions did not always facilitate this type of learning for interviewees, more than half of survey respondents had an opportunity to learn in this way within lecture courses. For instance, when asked to state their level of agreement with the statement, "In university lecture courses, I learned practical skills about my discipline," 53.9% respondents selected "Agree" or "Strongly Agree." Moreover, when asked to expresses their level of

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agreement for the statement "In university lecture courses, I cared more about understanding the material than I cared about getting high marks," 54.3% respondents replied "Disagree" or "Strongly Disagree." This statistic poses the idea that many women across different public institutions prioritize their academic GPA, even when they feel dissatisfied with the quality of education they are receiving.

Generally, interviewees were not satisfied with only mastering content knowledge on paper; they wanted to apply the theories with tactile exercises in laboratories and in the field. Interviewees' annoyance with the clear divide between the theoretical knowledge they learned and the practical experience they needed came up in meetings with Melat, Tiya, Sewit, Nardos, and Yeshi. Along with this critique of theory-heavy learning, their disapproval of laboratory facilities available to them on campuses also emerged during analysis. Interviewees often lamented the inadequate laboratories and described them as crowded and full of outdated equipment.

These women's critiques are consistent with the international comparative work of Hofstein and Lunetta (2004), who argue that instructors in laboratory courses have primarily a managerial role. To remedy this, these scholars contend that lab instructors should instead solicit ideas and probe the conclusions that students make. Lord and Orkwiszewski (2006) take this a step further by advocating for an inquiry-driven (rather than procedure-driven) approach to laboratory classes. Within this pedagogical paradigm, lab instructors would prepare a set of open-ended questions that each student would be responsible for answering through advanced research, method development, and analysis.

Lord and Orkwiszewski conclude that inquiry-driven instruction can help students move beyond memorization, and into the retention of material.

Nardos' explanation of how she wrestled with material in her Chemical Engineering courses (Interview 2) exemplifies how she and many others came to master course content:

> I think I took it step by step, like daily basis I think. Because there were a lot of times that I actually wanted to quit. I'm not going to lie to you. Because it's really difficult. And when you see you being – working hard and studying hard and you found all those rules that you review is not necessarily like valuable in some cases. Because you can see other people clearly passing without – not even studying, not even being in the classroom, not doing assignments, especially in the group work is what's really hard. Because all of the students don't actually work effectively as you. They actually pass through your shoulders. When you do all the hard work and they – because you are in a group, they actually credit for your work. So it was really difficult sometimes.

In these remarks, Nardos emphasized her value of hard-work and growth over time, even when faced with the challenge of group projects in which she had to do a disproportionate share of the work. By working methodically and consistently ("I took it step by step,"), Nardos gained an understanding of course material. Similarly, Fanta (Interview 2) elaborated on how simple memorization and regurgitation of material was not a sufficient strategy for doing well in Civil Engineering courses.

You just can't pass it by just looking at a slide or the teacher describes it. No. You

have to see the real effect in order to really understand and imprint it in your mind

and remember it.

Cumulatively, these interview excerpts emphasize the idea that interactive, engaging lab

experiences are a fundamental part of student learning. However, 55.0% of survey

respondents selected "Agree" or "Strongly Agree" when presented with the statement, "I

learned a lot of information from lab courses." Most survey respondents, 65.3%, also

participated in an internship, which suggests that they had an opportunity augment their

classroom learning with tactile and practical experiences in their field of study. This

discrepancy between the experiences of interviewees and survey respondents implies that

interviewees encountered particularly poor laboratory conditions. Despite the difference

in their perception of the adequacy of laboratory courses, both interviewees and survey

respondents stressed the necessity of these learning spaces. Researchers like Freeman et

al. (2014) would agree with this assessment from study participants. In their meta-

analysis of 225 studies, Freeman and colleagues found that students were 55% more

likely to fail a STEM course if it was exclusively lecture based, as opposed to a

combination of lecture and active learning. Laboratory courses are a venue for active

learning, and as such, study participants' tendency to emphasize the value of lab classes

is consistent with a desire to engage in meaningful learning.

Another pivotal subcategory of themes among interviewees was the realization

that grades were not necessarily a reflection of achievement. Yeshi explained (Interview

1), like many others, that she did not need a perfect GPA to feel like she accomplished

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her goals as an undergraduate engineering student. Instead, her motivation in college was to learn the material and to graduate, she said:

> I wasn't an A student, but I survived. The point was for me to finish college and start working. And I did. And I did finish without lacking any course, without wasting my time physically.

Later, in the same interview, Yeshi elucidated on why the current university curriculum at Hawassa University, which skimped on practical experiences, was not ideal:

> So what the problem was, engineering, it's a very practical subject. So when – suddenly, when you're, I don't know, learning about mechanics and dynamics and stuff, it's – you may have the basics theoretically, but if you don't have – if you don't see it, like what does that mean? When people talk about drawing – joints and structurally speaking and stuff like – what does it really mean?

In this snippet, Yeshi communicated a desire for practical experiences that would make class learning more relevant outside of academia. Tiya also echoed this sentiment during our last interview. When I asked her the open-ended question, "How can education in this country be improved?" she explained that the standard for student evaluation needs to change. As she elaborated on this answer, she pointed out that:

> We are not given – after testing us, we are not given anything. Or we are just given the result and that's it. It's as – it's just about giving you results and you learn, or if you fail or you pass, and you are given that result. But I think, as long as I understand, the objective of test is examining. They say this to us, but it is not practical. It's testing the potential of a student. And I don't think that exam in

paper or on something they want – doesn't appropriately – or it's not enough to

judge the potential of that person.

Her answer was profound. Not only did Tiya recognize the limitations of traditional

evaluation mechanisms for students (which seem to be a one-time, episodic

measurements of content knowledge), but she also alluded to the necessity of uncovering

and promoting a student's potential.

Overall, interviewees communicated their quest for more meaningful learning

through their desire for curriculum reform. They expressed a need for total curriculum

overhaul, so that the material presented to them in class becomes more practical, more

creative, and solution oriented. Students like Nardos and Sewit, specifically, wanted a

solution-oriented curriculum that was designed to train students to meet Ethiopia's

infrastructural needs. Additionally, 68.8% of survey respondents stated that the major the

Ministry of Education assigned to them was also the discipline they wanted to study. This

alignment between what students wanted and what they were assigned by the government

shows that many students had a genuine interest in the subject area. Equipped with this

insight about female students preferred learning environments, education leaders and

policymakers have an exciting opportunity to strengthen the existing curriculum at public

universities by making it more practical. Additionally, interviewees' dissatisfaction with

laboratory facilities shows the need for revamping laboratory courses.

Theme 3: Muting of female identity. Perhaps the most surprising finding in the

qualitative phase of the study was the reluctance of participants to see their experiences in

education as uniquely gendered. Interviewees like Fanta were adamant about how gender

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was not an important determinant in her persistence in university, even though she herself had mentioned that she and her classmates would take advantage of gender differences when communicating with faculty (see Chapter 3: Methodology, the participant profile on Fanta). And whenever gender was discussed as a salient part of teaching and learning among interviewees, they seemed to privilege the male perspective. For example, respondents like Fanta, Melat, and Nardos told me that they did not prefer neither female nor male professors, as long as their instructors were qualified and able to teach effectively. Meanwhile, participants like Liat and Selam told me that they preferred working with male students. When I asked Selam why this was the case, she admitted that it was "because the female classmates are a little bit slow. So they cannot exactly fit with me" (Interview 2). Her response—which shows that she sees herself as distinct from her female classmates—suggests that Selam unwittingly internalized stereotypes about women.

The response from survey takers frequently complicated this proclivity amongst interviewees. Generally, response from the survey instrument showed how women who took the survey did value same-gender interactions in academic and professional settings. For example, 53%, 68.7%, 49.6%, and 72.6% of survey respondents selected "Agree" or "Strongly Agree" when asked to rate the statements the following statements, respectively:

- Younger women reach out to me asking me for advice about science technology
- I want to mentor younger women who are interested in science and technology

- Having female teachers in secondary school was important to me

- Having female classmates in secondary school was important to me

Perhaps interviewees in this study were reluctant to cultivate substantial same-gender relationships with classmates because they did not want to be associated with the stereotypes of female students. In their work on Black engineering students in the U.S., McGee and Martin (2011) documented how high-achieving undergraduate students developed success-oriented belief systems when they encountered racist stereotypes. These authors describe this process of negotiation as "stereotype management," and argue that as students progressed in their studies, they enacted more self-determination and solidarity with other same-race peers. While survey respondents might have exhibited a similar approach to stereotype management, the interviewees in this study did not.

Many interviewees also displayed an aversion to the gender office offered on each of their campuses, particularly the participants from urban, middle/upper class backgrounds (who are also illustrated by the Aida archetype). In lieu of using the support services offered through the gender office, they seemed to rely on (notions of) merit, self-efficacy, and individual responsibility to help them get through their university years. Thus, women-focused, student-affairs programming such as the Undergraduate Success Program (USP), offered at Addis Ababa University, were talked about disparagingly. Participants like Bisserat, Fanta, and Sewit confessed that they had never used the services of the campus gender office beyond their mandatory, first-year orientation. Equivalently, Sewit described her explicit disdain for the gender office at Bahir Dar

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University. In our third interview, when I asked her why she never used the services offered through this office, she admitted:

> No, because I never needed it. And also, it's the position, like it's for – it puts girls like the weak people in the space and like oh, you need support because you're a girl. And then you go to the gender offices and it's this – I don't know. I honestly do not need them. But also it's because I didn't think they were the right people for me finding good help in that space.

Sewit's response is a microcosm for how many interviewees felt about any aspect of their education that highlighted their minority status as female. Generally, interviewees were quick to negate the salience of being a woman, especially when their identity as female ever came into conflict with their identity as a scientist or engineer. Perhaps this tendency to negate femaleness is a function of the broader, collectivist Ethiopian culture. As Kurman (2003) shows, self-enhancement is typically low in collectivist cultures that foreground the wellbeing of the group, rather than the individual. In the case of study interviewees, perhaps they hesitated defining themselves as women, and preferred labels such as "engineers," because this self-identification would distance them from the larger campus community. Alternatively, interviewees' reluctance to identify as a woman might have been evidence of their own, internalized patriarchy. As one of few women to have graduated (or made it to their final year of college) in each of their respective majors, these women might have recognized how women's persistence in higher education is an aberration. This perception is not far-fetched, considering how education institutions tend to oppress women through gendered divisions of labor, in which women are over-

represented in lower-level administrative positions, and almost completely excluded from upper-level leadership (Kelly, 2017; Semela et al., 2017). After observing this, interviewees' might have wanted to distance themselves from a female identity because it seemed contradictory to being competent and respected members of the campus community. In this regard, interviewees failure to push-back against this gendered oppression, and instead find ways of working within it, shows that they accepted the inherent patriarchy of education.

The unwillingness to embrace an explicit gender identity was also present among participants in the second phase of the study. The greater part of survey respondents (47.1%)[5] selected "Disagree" or "Strongly Agree" when asked to rate the statement, "I used the services of the gender office." The limited utility of the gender office is counterintuitive to much of student affairs literature, which often upholds identity-focused centers as necessary mechanisms for the integration of historically underrepresented students. For example, Museus (2014) argues that the availability of holistic support is an integral part of a culturally engaging campus environment for minoritized college students. Theoretically, the gender offices in Ethiopian education are akin to the multicultural offices in the United States. However, the narratives of both interviewees and survey respondents in this study demonstrate how that this is not always the case for historically underserved students in Ethiopia. To complicate this further, as demonstrated in Chi Square test of association #73 (Chi-square=9.624, $p<0.05$, df=4; available in Appendix S), a statistically significant relationship existed between a

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[5] Only 24% of survey respondents "Agree" or "Strongly Agree" to this survey item.

student's desire to stay in the same city as her undergraduate institution (measured as a categorical variable), and perceived utility of the campus gender office (measured as a Likert-scale variable). This test of association and corresponding contingency table suggest that women who feel comfortable in the city that their university may also be less likely to take full advantage of the campus gender office (although this was not confirmed by the bivariate correlation coefficient, which shows that the correlation between these two variables is not statistically significant, see Table 4).

Occasionally, the silencing of female identity teetered toward hostility among interviewees. When talking about the affirmative action program instituted by the Ministry of Education to increase the number of women in public universities, Abigail, during Interview 3, explained:

> So I'm against affirmative action. So I don't think anything different for the – should be done for the girls. But I think more chance – more competition should be offered like activities in the campus. I am – competitions, invention test, invention competitions – I don't know, that would give you a different chance. For example the prize might be a trip to NASA maybe. A trip to MIT for any students who learn in the Institute for Technology, it's a dream to see MIT – as it is the world's first technology institute.

Meanwhile, in the second conversation with Bisserat and Eskedar, they explained why they normally do not interact with other female students. Bisserat pointed out that:

> I'm not taking it personally, but I don't think girls like us. I don't know why. I mean, I don't feel comfortable when I talk with girls. I feel like they don't like me

because I'm straightforward and guys are like that most of the time. They are

straightforward and they tell you what they mean. So I think that's a part.

The irony here, of course, is that both Bisserat and Eskedar are women themselves and

they like one another a great deal. Both interviewees also appeared traditionally feminine

in their dress and appearance. So, the way in which Bisserat and Eskedar considered

themselves as the type of people who did not get along with other women seemed

incongruous with their inter-personal behavior and feminine personas. Previous research

has shown that friendship is a fundamental part of retention for students in their first year

of undergraduate study. Moreover, favorable living conditions in a dorm are a key

element of developing these friendship (Wilcox, Winn, & Fyvie-Gauld, 2005). In the case

of this study, the experiences of Bisserat and Eskedar nuance the conclusions reached by

Wilcox and colleagues. Perhaps a competitive academic environment at Addis Ababa

University made same-gender friendships (outside of the friendship they shared with each

other) challenging for these two interviewees. It is worth noting that both Bisserat and

Eskedar lived on campus during their first year and decided to live at home with their

families in subsequent years (mentioned during Interview 2). In keeping with Wilcox et

al.'s (2005) study, perhaps this decision to leave campus housing prevented them from

cultivating lasting friendships with other women at their undergraduate institutions. On

the other hand, survey respondents appeared to be more comfortable with the idea of

having female colleagues and friends. For example, when asked to state their level of

agreement with the statement "I want to interact with more women who are science and

technology professionals," 64.7% of respondents selected "Agree" or "Strongly Agree."

While many interviewees talked about other female students as a separate category that they did not belong in, few students articulated dissatisfaction with the systems that maintained the subordination of women. Consequently, a critical examination of power structures that keep women behind was seldom discussed. Tiya began to engage in some of this critique during our last conversation when she stated:

> Female students are not free to ask questions as male. It's not because the teachers are not willing. The teachers are willing. They are providing – they are – I mean, they are willing for everything. But you know what? You don't feel free just being female. If it's politics, you are not free.

Two other notable exceptions to this general trend of distancing themselves from a female identity were Feven and Netsi. Both students seemed to recognize the salience of womanhood in higher education, as demonstrated by their participation in undergraduate women's organizations and their positive assessment of female professors. During our first and only interview, Feven explained:

> In university, most of our teachers were male, but like two or three were a woman. In fresh, we had to start – teacher, a woman. She was very nice, very, very nice. You can connect with her. She wasn't that tough. She was very understanding person. She was very good, I think. And after that, I think we have one management teacher. She also was very nice. I did like her. So I did like two or three women teachers that gave us lectures or that taught us.

She went on to contrast these female professors to the men that taught them:

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The men were very hard. They were very hard. I don't have a word to express

them. You will see them, and you can – you don't know what's going on in their

head. They're very – I don't have a word. I really don't have word with them.

They were very tough. Tough. They were very hard. Not tough. They were very

hard. You can't communicate with them.

 It was interesting that the two participants who seemed to be most comfortable

expressing the salience of their gender were also the two people who were most explicit

about disliking their majors. Feven and Netsi repeatedly mentioned how they felt forced

into studying Construction and Technology Management at Addis Ababa University, and

described their time in college as "five very long years." As individuals who did not

enjoy their academic journey in college (and by extension, their academic identity),

Feven and Netsi embraced other aspects of their identity as a coping mechanism.

Compared to the rest, this third finding was the most baffling. Most interviewees

simply did not want to acknowledge the relevance of being a woman in their pursuit of a

degree that was almost exclusively pursued by men. Based on the low numbers of women

in public universities, I had assumed that the few women who were enrolled would flock

together as students and seek out the mentorship and guidance of female professors. I

also assumed that these women would rely heavily on the women-focused support

programs offered through the university because the campus environments of public

institutions have traditionally catered to the needs of men. I was wrong on both accounts.

Not only did study participants generally deride social relationships with other women,

but they also did not depend on the gender office on each campus to help them persist in

higher education. These two tendencies were especially common for women who fit within the Aida archetype, because they often had other, privileged social identities that they would more comfortably express.

Moreover, I argue that one of the other reasons participants did not regularly utilize the gender offices was the spatial positioning of these offices on campus. Since the spatial formation of a university can serve as a reflection of institutional values (Beyes & Michels, 2014), the physical dimensions of a university offices can provide us with insight about what institutional leaders care about the most. At AAU's 4 Kilo campus, for instance, the gender office was relegated to a far-flung corner of campus, next to open drains that emitted a strong, foul smell. Additionally, the office itself was cramped, and located in a dimly lit corridor (see images below).

Figure 6. Entrance and surrounding corridor of the AAU, 4 Kilo Gender Office. Photos taken on 03/22/2017.

The positioning of this (presumably) important office on campus could indicate that the institution itself does not prioritize the services offered through this unit. Perhaps the women I interviewed in this study picked up on this sentiment, and therefore echoed their disdain.

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Furthermore, much of the messaging directed towards women on the CNS and IST campuses tended to be overly simplistic and juvenile. The infantilizing of women, and the challenges they face, may have also contributed to interviewees' choice to mute their female identity. For instance, a corkboard next to the gender office of AAU (CNS campus) featured a collection of posters and flyers. One of these featured a cartoonish depiction of a group of uniformed school girls in front of a school (see Figure 7 below). In the background of the cartoon, two adults (one man and one woman) stand with arms crossed, in what appears to be a protective stance, looking over the students entrusted to their care. The title of the poster (written in Amharic script, or *fidel*) reads: "Girls should be educated and protected from harm. Peace to women from home to the town square." Tacked on to the poster was an additional notice that read: "The gender office of the College of Natural Sciences is partnering with the Yeben Endowment Fund to prepare an economic support program. If you are one of the people that filled out the form based on the advertisement that came out on Yekatit 29, 2009, come to tomorrow's meeting at 11:00AM."[6]

When adult undergraduate students view such posters, they may register the images and text as childish and patronizing. Seeing oneself depicted as a school girl in a secondary school uniform, for instance, may illicit feelings of disdain. So, when women in this study were subjected to problematic messages—such as the one in Figure 7—over

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[6] Ethiopia follows the Gregorian calendar, which has 13 months in one year. Yekatit is the name of a month. Additionally, the Gregorian calendar is typically eight years behind the Julian calendar. Thus, the year 2018 in the United States is recorded as 2010 in Ethiopia.

the course of many years in college, they may have gradually come to see the gender

office and other women-focused student affairs programming as irrelevant to their lives.

Figure 7. Poster Next to AAU CNS Gender Office.

Notwithstanding this reluctance to see gender as salient, the responses and

experiences of all study participants are valuable. It is imperative to acknowledge that

certain study participants are not performing gender more authentically than others. The

women in the study who saw their womanhood an essential part of their university

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experience (such as Feven and Netsi) are credible sources of empirical data. Meanwhile, the many women in the study who did not view their womanhood as an essential part of their university experience (such as Abigail and Sewit) are equally credible sources of empirical data. These women are the experts of their own subjective reality, so to discredit or dismiss the validity of any of their viewpoints would be oppressive. Mohanty (1988) supports this methodological approach when she argues that "…the category of woman is constructed in a variety of political contexts that often exist simultaneously and overlaid on top of one another" (p. 73).

External Factors Related to Persistence

When reviewing participants' interviews and survey responses, it became evident that a great portion of their success was due to structural systems that worked in tandem to ensure their persistence in a an otherwise "leaky" higher education pipeline. Espinosa (2011) models this type of analysis in her pivotal study, titled "Pipelines and pathways: Women of color in undergraduate STEM majors and the college experiences that contribute to persistence." Espinosa argues that women of color in the U.S. benefit from undergraduate research programs, attending colleges/universities with a substantial STEM community, and attending private colleges. As a result, Espinosa advocates for learning environments that facilitate peer-to-peer interaction, co-curricular involvement, and undergraduate research to promote retention of female students of color. In the case of women in Ethiopian universities, similar structural aspects were correlated with women's persistence. For example, amongst the fourteen women interviewed in the qualitative portion of the study, an external factor that seemed to influence persistence

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was the type of secondary school a woman attended. The importance of high school on higher education outcomes is consistent with the work of scholars like McDonough (1997) and Engberg and Wolniak (2010). These scholars demonstrate how the type of, as well as the quality of secondary education students received largely shapes their academic preparation for higher education.

Additionally, the familial habitus that a woman had access to also appeared to be linked to the persistence of interviewees. The prominence of this factor is also seen in quantitative results: women who had at least one university-educated parent or sibling had statistically significant different perceptions about various aspects of their education experience, including: the availability of people in their families who they can talk to about science and technology careers (demonstrated by the results of Chi-Square Test of Association #1); the adequacy of course materials in high school (demonstrated by the results of Chi-Square Test of Association #2); and sense of preparedness for university curriculum (demonstrated by the results of Chi-Square Test of Association #3). Finally, a student's enrollment at higher education institution in an urban region of the country was crucial external factor related to persistence. Since the quality of life in urban centers typically exceeds that of life in rural areas (Haile, 2004), study participants who attended a university in an urban center appeared more frequently in the data than participants who attended a university in a rural region.

Theme 4: Relevance of Secondary Education. The bulk of interviewees studied at single-gender, parochial, private high schools in Addis Ababa. Examples of these secondary schools include Lideta Catholic Cathedral School, St. Mary's Catholic School,

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and Nazareth School. While each school has its individual campus culture, all of these institutions are recognized as academically elite and well-resourced. Among these, the most prominent was Nazareth, a private, all girls high school in Addis Ababa that a sizable number of interviewees (n=5) attended. Established in 1953 by French nuns from the Society of the Daughters of the Heart of Mary, Nazareth School is located near the AAU CNS campus, enrolls about 50 students per grade, and is widely viewed as one of the most prestigious secondary schools in the country ("Nazareth School ", 2015). In addition to its reputation for academic excellence, Nazareth School fosters a sense of long-lasting community among students. The positive impact of this school is so far reaching that a group of alumni even started an official, 501I(3) non-profit organization in the United States to support the mission of this high school. Headquartered in Chantilly, Virginia, the Nazareth School Alumni Association aims to: provide scholarships for current Nazareth students; facilitate a multi-generational mentorship program for current students and alumni; and lastly, to foster an expansive professional network among graduates (Agedew, Solomon, & Bushen, 2017). The continued engagement of students who went to Nazareth School, even long after their graduation, shows how effective this secondary school was in cultivating a sense of community.

When describing why this school produces young women who go one to become successful at the university level, Sewit (a Nazareth School alumnae), insisted during her first interview:

Yeah, Nazareth School is great because it's not just about education…They support you on. I could be the fashionista. It doesn't – and it really gave us space

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to find ourselves and that really goes a long way because when we went to – and

that's why I said it's – I understand almost all the girls that you would find in this

country that are very confident, that are really doing crazy cool things that are out

there exploring and most of them come from that school because when you go

out, you have your head high and nobody can shake that and you can just say I

don't care actually. I know what I'm good at. I know what I want. And most girls

don't have that luxury to say this is what they want. So really it helped me when I

also went to college.

The quality of education provided in elite high schools, like Nazareth School, also

impacted interviewees' readiness for their university entrance examinations. While being

a barrier for entry for many other pre-university students, the women interviewed for this

study generally scored well on the standardized, national exams administered in 10th and

12th grade. According to Abigail, Eskedar, Feven, and Selam (who all attended private

high schools), they scored relatively well on both exams and received a high enough

score to attend their top institution. Based on interviewee responses, women who

attended private high schools felt better prepared, as well as performed better in these

national exams than their peers in the study who attended public, government-funded

high schools. Among survey respondents, nearly half of the entire study sample attended

private secondary schools (single gender and mixed gender). Specifically, 7.4 % of

respondents attended a private, all-girls high school, while 37.3% of respondents attended

a private-mixed gender high school. Combined, private high school alumni are not quite

the majority, but they make up a sizable portion of survey respondents. While correlation

does not imply causation, the tendency of many study participants to attend private schooling might signify how beneficiaries of private schools are particularly well positioned for persistence in higher education.

And although this was not explicitly stated by participants, attendance at private schools—like Nazareth School, Nativity Girls School, and St. Joseph's School—might also be a proxy of their middle/upper class economic status. This assumption is supported by participants' answers to questions about financial constraints experienced as undergraduate students. Most participants who attended private secondary schools said that they did not experience financial difficulty in college. Students like Abigail, Fanta, Selam, Sewit and Yeshi, felt like they had sufficient financial support from their university stipends and their families. Abigail, during our first interview, mentioned:

> We don't pay when we learn in the university. Actually, the university pays you to learn. We have a cost-sharing [stipend] every month we take so the – literally, they invest in you and support you. *But my parents support me more. They still give me money for copies, for transportation, for food and sometimes for relaxation* [emphasis added].

Meanwhile, public secondary school graduates, like Melat, did experience financial difficulties as undergraduates. This distinct difference in financial circumstances is consistent with the dichotomous categorization of participant archetypes. Women like "Aida," who come from upper-class families, did not have to deal with financial strains during college. Women like "Desta," meanwhile, did feel the financial burden of coming from a lower-class family who could not as readily provide her with financial support.

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Additionally, the type of secondary school women attended might have had bearing on their English language fluency. According to survey results, 55.4% of respondents described themselves as fluent English speakers. Furthermore, when asked to rate their level of agreement with the statement, "The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate," there was a significant difference between those who consider themselves English speakers and those who do not (chi-square=14.991, p<0.05, *df*=4; as noted in Chi-Square Test of Association #24 available in Appendix S). This association was corroborated by a statistically significant correlation between these two variables (see Table 4).

Though it is not possible to assess causality based on this survey statistic, it is plausible that materially well-resourced secondary schools—like Nazareth—also had the human resources and capacity to prepare their students to read, write, and speak English fluently. Conversely, it might be that fluent English speakers come from socio-economic classes that allow them to access well-resourced secondary schools. Ultimately, the association highlighted in the table above is critical to note because curriculum in public universities is largely delivered in English.

The pertinence of high school type to the study of higher education is one worth investigating thoroughly. For the participants in this study, alumnae of private secondary schools were better prepared for the academic and financial aspects of university life. Additionally, these privileged women had greater access to peer, parent, and college-oriented networks that most likely helped them persist once they matriculated. This trend is echoed in the scholarship of McDonough (1997), who argued that college choice is

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distinctly structured for students, depending on what type of high school they attended (working-class public high school; upper-middle class public; private preparatory; and Catholic school). The findings of my study expand the foundational work of McDonough by showing how high school type shapes outcomes for college placement persistence (outside of the United States), even when students do not necessarily have a pronounced choice in which higher education institution they attend.

Theme 5: Familial Habitus. The educational positioning of women in relation to their family members was another striking theme that emerged during analysis. Many participants benefit from a "familial" habitus that gave them access to many university-educated family members. McDonough (1994) defines habitus as an:

> internalized, permanent system of outlooks and beliefs about the world that an individual learns from his or her immediate environment. It is a common set of subjective perceptions held by all members of the same group or class that shapes the individual's expectations, attitudes, and aspirations (p. 430).

In this group of participants, women's outlooks and beliefs about science/technology education and careers was shaped by the expectations and aspirations of their family members. Not only did many respondents have at least one university-educated parent, many also had multiple university-educated siblings that could model university education for them. For instance, Abigail, Nardos, Netsi, and Sewit were the youngest in families of multiple children. These youngest siblings also had at least one sibling that acquired an undergraduate degree in Ethiopia. This immediate access they had to educated family members meant that they could benefit from the culminated knowledge about higher education and the science/technology careers that their siblings had gained. For instance, Abigail—a senior at Addis Ababa University IST, studying Civil

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Engineering—had an older brother who was a Master's student at the time. Her older brother had not only graduated from same program she was currently in, but he was also enrolled in a graduate degree on the same campus at the time of the interview. Through him, Abigail had unique insider knowledge about how to navigate the Civil Engineering Department and the wider university landscape in a way that other students might not. For participants like Sewit (who had an older sister who graduated with a degree in education from Bahir Dar University) and Nardos (who had an older sister and brother who graduated with a law and computer science degree, respectively), their older siblings' educational achievement might have inspired them to persist in their own pursuit of a B.S. degree. Similarly, data from the quantitative survey shows that 49.5% of respondents had at least one-university educated parent, while 69.6% of respondents had at least one-university educated sibling. Arguably, these women's siblings served as "linkages" (Brian, 2007) to people and groups further up the social ladder. In doing so, these educated siblings helped women increase their social capital (Bourdieu, 1986) during college, which then helped them persist.

The potential benefits of having educated family members were clear among survey responses. Being the daughter of at least one-university educated parent or being the sister of at least one-university education sibling was significantly associated with multiple survey items. When comparing respondents who did have at least one university educated parent to respondents who did not have at least one educated parent, noticeable differences emerged for scale items. For instance, when asked to state their level of agreement for the statement "I have people in my family who I can talk to about science

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and technology careers," there was a statically significant difference ($p < 0.05$) between people who were the first-generation university attendees and those who were not (see Chi-Square Test of Association #1 in Appendix S; chi-square=14.797, p<0.05, *df*=4).

This statistic might suggest that participants' proximity to university-educated parent(s) provided them with a strategic social advantage that informed their academic trajectory in college. Additionally, the significance of this association was confirmed by the bivariate correlation coefficient (see Table 4). These statistical associations are consistent with the work of Hoffman, Louis, and Hoffman (2010), who expound on the decision making process of children who have university-educated parents. Based on interviews with daughters of engineering parents, Hoffman et al. (2010) found that educated parents helped deconstruct some of the sexist myths that are embedded into the engineering industry.

Among survey respondents in this study, there was also a significant difference in their perceptions of course materials from their high school. When asked to rate their level of agreement for the statement, "The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate," there was a statistically significant difference ($p < 0.05$) between people who were the first-generation university attendees and those who were not (see Chi Square test of association #2 in Appendix S; chi-square=11.364, p<0.05, *df*=4). Similarly, the bivariate correlation for this relationship was statistically significant (see Table 4).

While this association may seem trivial at first, it hints at an important aspect of the quality of secondary education, and how that could influence higher education

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outcomes. Card and Krueger (1996), for instance, have shown that increased resources (expenditure per pupil) in schools lead to higher test scores for students in North and South Carolina. For the participants in this study, the statistically significant association between parent(s)' education level and adequacy of school materials/facilities proves that parents' education is positively correlated with upper class (and by extension, access to better schools). Furthermore, there was a significant difference among this group in their perception of preparedness. When asked to rate their level of agreement with the statement, "My secondary education sufficiently prepared me for university classes," there was a statistically significant difference ($p < 0.05$) between people who were the first-generation university attendees and those who were not (see Chi Square test of association #3 in Appendix S; chi-square=15.252, p<0.05, df=4). This association suggests, perhaps more clearly than any others, the notability of parent's education level on the persistence of women in public universities.

What is more, siblings seem to also have a unique impact on the outcome of undergraduate students. Gofen (2009) argues that older siblings who have already accessed higher education can support younger siblings in the family. When discussing how these familial interpersonal relationships impact academic outcomes, Gofen explains that the "…first child to go out and study [usually the eldest, but not always] served as a role model for the younger siblings and helped the parents inculcate the importance of education" (p. 112). Thus, in addition to parents making a difference, having siblings who have been educated is also meaningful. Gofen's theory was supported by a few of the Chi square tests in this study. For instance, when asked to rate if, "The course

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materials (textbooks, lab equipment, etc.) in my secondary school were adequate," there was a significant difference between respondents with university-educated siblings and those without (see Chi Square Test of Association #15 in Appendix S; chi-square=13.094, p<0.05, *df*=4). Like the significant associations between university-educated parents and the adequacy of course materials, the test of association suggests clues about the socio-economic class of the households that respondents came from. Participants from wealthier households likely could attend high schools that were well-resourced enough to provide adequate textbooks, lab equipment, and other material goods for their students.

Likewise, Chi Square Test of Association #19 (see Appendix S; chi-square=12.823, p<0.05, *df*=4) indicates how there is a significant difference between respondents with university-educated siblings and those without in response to the Likert-scale statement, "I learned a lot of information from lab courses." This association implies that survey respondents' with at least one-university educated sibling might have better synthesized course material from university lab courses. Alternatively, respondents without university-educated siblings may have had fewer opportunities to develop effective study strategies that would have helped them get the most out of their lab classes.

Ultimately, while not having access to a university educated parent(s) or siblings did not did not prevent the remainder of study participants from persisting, this aspect of familial habitus likely made university persistence easier. In their study of family scholarly culture, M. D. Evans, Kelley, Sikora, and Treiman (2010) investigate how a

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home environment focused on literacy and schooling can benefit the performance of children at school. Analogously, the presence of university-educated siblings in this study might have promoted persistence by linking women to cultural capital, and access to information that only elite, university-educated people in Ethiopia have access to.

    Theme 6: Legacy of Urban Public Universities. Living in an urban area was a clear preference of most participants in this study. While this is in part a consequence of the study design itself (I only recruited students/alumnae of public universities), this theme is relevant because participants often described their own persistence in comparison to the (lack of) persistence of students who attended institutions in rural regions. For example, when I asked Abigail if she wanted to be assigned to Addis Ababa University when she was still in high school, she responded by saying: "Yes. Obviously, if you studied in Addis you would like to stay here…Because there is amily around. There's guidance." (Interview 1). The location and reputation of Addis Ababa University, especially, seemed to play a role in why women could persist at this institution. In relation to laboratories for instance, the facilities at AAU are (relatively) the best that the public higher education system can offer. During Interview 2, Eskedar explained that other public university students came to her campus, the AAU Institute of Science and Technology, to use their laboratory facilities:

> I know there's [other] university students…they take 15 days to come to our laboratories and they exercise in our laboratories because they don't have any laboratories in their campus.

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Later, in the same interview, both Eskedar and Bisserat mention other institutions that have sufficient laboratory facilities, and all the institutions that they mention happen to be in urban areas, including the public universities of Jimma, Mekelle Bahir Dar, Arba Minch, and Gondar.

Survey respondents revealed similar preferences about the preeminence of universities in urban areas, especially Addis Ababa.[7] For example, when asked the question "As a university student, was your assigned campus your first choice?" 69.6% of respondents answered "yes," For those who selected no, the survey prompted them to include which campus they initially wanted to attend. For this follow up prompt, the most frequent responses were universities in metropoles, including: Addis Ababa University[8] (n=33), Jimma University (n=5), Gondar University (n=5), Mekelle University (n=4), Bahir Dar University (n=3), and Hawassa University (n=2). Respondents' answer to this item is meaningful because it provides insight regarding the bounded rationality of decision making (Kahneman, 2003) for students in the Ethiopian education pipeline. Specifically, students' desire to be in urban areas might be related to the quality of education between old generation universities (which tend to be in urban areas) versus new-generation universities (which tend to be in more rural areas). Tesema and Braeken

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[7] Methodologically, it is important to acknowledge the role of self-selection among study participants. Since I lived in Addis Ababa while I collected this data, most individuals I met during the research process lived in the same city. Thus, the tendency of people to prefer Addis Ababa might have been more related to coincidence since we were in the city of their preference, rather than a generalizable characteristic of all women who attended a public university in Ethiopia.

[8] This frequency includes all campuses of AAU, including the Institute of Science and Technology, the College of Natural Sciences, and the College of Health Sciences.

(2018) further complicate this stratification in their study about regional inequalities and gender differences in academic achievement. These authors argue that Ethiopia can be considered a country with three regions: emerging, established, and central. Emerging regions are relatively traditional, marked by low development (economic and infrastructural), and face frequent drought. Examples of such regions are Afar, Somali, Gambela, and Benishangul-Gumuz. Conversely, established regions include both urban and rural areas with more developed infrastructure. Due to increased industrialization in these areas, established regions have indicators that promote persistence in education, including better gender parity. Examples of these regions are Tigray, Amhara, Oromia, Harari, and the Southern Nations, Nationalities, and Peoples' (SNNP) region. The third category, the central region, includes two cities (Addis Ababa and Dire Dawa) that are administered by the federal government. Both cities enjoy growing economies and many private schools. In light of this categorization from Tesema and Braeken (2018), the preference of participants' for certain universities makes sense. People living in emerging regions face precarious social conditions. In effect, this also means that the public higher education institutions in these regions (like Samara University in the Afar region; Jijiga University in the Somali region; or Gambella University in the Gambella region) must deal with even more stressors than most other universities that are already fledgling as massification (Areaya, 2010) continues. Moving forward, it is imperative that higher education scholars move beyond a simple urban/rural dichotomy when considering the position of universities, and interrogate how the characteristics of emerging, established, and central areas play out in higher education governance and organization.

Additionally, an excerpt from Melat's third interview also supports the idea that urban-located public universities are the most preeminent:

In the system in general, it might be different to think this one because it is a different environment living in rural areas and living in urban areas. It is a very different situation they are experiencing. But I think after 15 years, our education system is declining in its qualities almost, becoming very low. So there have to be changes that have been done and what are the recommendations to strength the education system and to make the effort previously. If you heard the entrance example, the national exam will be taken at grade 12 and before that all the students will go in together. But now it starts at 10 and also they have the national exam twice. So when they reach at grade 10, they see I think an age to know what they really wanted because the education system doesn't encourage to know what the quality in each students. It is simply they treat all students the – we treat all students the same way. We don't know what special interest.

In this excerpt, Melat pointed out the difference in quality of education in urban areas versus rural areas. Here, she also talked about the danger of educational administration that homogenizes student learning. By treating "all students the same way," Melat explained how valuable skills and interest areas of individual students were being taken for granted.

While many respondents had wanted to matriculate into a university in an urban region, participants' descriptions of these universities demonstrated that these they were still flawed. One peculiar legacy of public institutions—even those in urban areas—is

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their inability to fully prepare students for the job market. Multiple women in this study enrolled in private universities, in addition to their regular course work at their home universities, to be more competitive for employment after graduation. Liat, for instance, pursued a certificate program in Accounting during scheduled school breaks at a private college in her hometown of Gamiti, in the Oromia region of Ethiopia. When I asked her why she pursued this, in addition to her Biology major at Addis Ababa University, she said flatly:

There – in biology, there's a lot of students that are learning from the beginning. While they are crowded, then there will be no jobs, so I have to have a choice.

Similar to Liat, Eskedar and Bisserat both took marketing classes in the evening at a private institution (Royal University College) to supplement their coursework in Civil and Environmental Engineering from Addis Ababa University. This is somewhat echoed in the numerical data, which showed that 17% of students took additional courses outside of their primary university, in subjects like accounting ($n=9$), economics and policy analysis ($n=1$), management ($n=1$), sociology ($n=1$), and English ($n=1$). Respondents' decision to go outside of the traditional higher education trajectory suggests that they do not fully trust in public institutions to provide them with all the skills they need for the job market. Students might also fear entering a job market in which there are many graduates who are competing for the same jobs with identical degrees and qualifications. This apprehension was particularly evident in Liat's response.

Bequette and Bequette (2012) tout a similar idea when they defend the place of arts-based pedagogy in STEM classrooms. Perhaps what both participants and Bequette

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and Bequette (2012) are ultimately calling for as a more holistic type of higher education curriculum. The specialized coursework required for public university science/technology majors is designed to make students into technocrats. While this focus is certainly aligned with Ministry of Education priorities (especially in light of the 70:30 science/technology to social sciences/humanities enrollment ratio), it may be limited in its effectiveness. As Boyte (2008) explains, technocracy has its limits. If only the intellectual contributions of "knowledge elites" like scientists and engineers are respected, then "…the authority of those without formal credentials is systematically undermined" (p. 83). Further, this elitism, which protects the beneficiary of a historically oppressive education system, goes against the tenets of postcolonial feminism.

Notwithstanding job-market issues, most participants enjoyed being in urban centers and wanted to remain in larger cities in the country post-graduation. Many interviewees—including Bisserat, Liat, Selam, Tiya and Yeshi—communicated a desire to live and work in Addis Ababa, specifically, after undergraduate study. This tendency was not common among study participants who took the survey. Quantitative results show that most women in this study (80.7%) were interested in graduate education outside of Ethiopia. Likewise, 58.8% of survey takers were interested in working professionally in other countries. Among survey takers, the desire to stay or leave the city of their undergraduate study was significantly associated with answers to certain Likert-scale questions. For example, when asked to rate their level of agreement with the statement, "The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate," there proved to be a significant difference between respondents who

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stayed/planned to stay in the same city as their alma matter and those who left/planned to leave (see Chi-Square Test of Association #64 in Appendix S; chi-square=10.333, p<0.05, *df*=4). The bivariate correlation coefficient comparing these variables was also statistically significant (see Table 4). Similarly, when asked to rate their level of agreement with the statement, "In university lecture courses, I learned practical skills about my discipline," responses from those who were interested in staying in Ethiopia for work were significantly different from those who were interested in going outside of Ethiopia (see Chi Square Test of Association #85 in Appendix S; chi-square=11.423, p<0.05, *df*=4).

The associations between dichotomous questions that ask about mobility (i.e. the desire to leave the city of their alma matter or the desire to leave Ethiopia altogether) and these Likert-scale questions provide us with insight about the desire mobility of women once they complete their baccalaureate degrees. It appears that satisfaction with the schooling process within Ethiopia might influence alumni's desire to live and work in country. More pointedly, women who had a traditionally positive experience with their secondary and higher education might want to stay within the same city and within Ethiopia. Alternatively, women who felt dissatisfied with their secondary and higher education wanted to leave. Intuitively, this decision-making process makes sense in relation to the archetypes presented earlier in this chapter. All women in this study managed to successfully overcome the many barriers to persisting in higher education. However, not all women had the same types of personal and institutional support to help them reach that point. Women like "Aida" had more incentive to stay in the same city as

their alma matter, and within Ethiopia in general, because they have access to professional and social resources that will facilitate their success after university. Meanwhile, women like "Desta" probably have fewer job and graduate education prospects within Ethiopia because they did not come from well-connected families. Thus, while study interviewees seemed generally optimistic about their in-country academic and professional prospects after college, they appeared to be in the minority among overall study participants

In light of these results, it is interesting that the Ethiopian federally government has heavily invested into higher education expansion with the hopes that alumni of these institutions will help propel the country of out poverty (Gardner, 2017b). Based in part on these survey results, it does not seem like the "brain drain" of educated Ethiopians (Gebrehiwot, 2017) will soon abate.

Regression Model

The final finding of this study is a statistically significant linear regression model. The outcome variable used for this model was participants' undergraduate GPA. While there are certainly many limitations for using GPA as the outcome variable, it is easily adapted for regression because it is a continuous value. And while GPA is not synonymous with undergraduate persistence, students with higher GPAs probably had many support systems (academic, social, financial, etc.) that helped propel them through university. These factors, in turn, are pertinent for answering the overarching research goals in this study. Additionally, GPA likely had bearing on the professional/academic outcomes of women once they left higher education. For instance, GPA played an

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important role in Sewit's career trajectory because she was offered a position at Hawassa University (as a physics lecturer) after graduation because of her high grades.

The regression model is that: participants' predicted GPA is equal to 3.619 – 0.070 (DIFFICULTY) – 0.189(CHOICE) – 0.017(SATISFACTION). The predictor variables were perception of difficulty of a woman's first year; the alignment between a student's assigned discipline and personal preference; and overall satisfaction with college major (the full SPSS output is available on the next page, Table 13). Furthermore, key statistical assumptions were met for this regression, so this model is useful for predicting the GPA for a larger population (beyond the study sample). This regression model also explains 12.8% of the variation in the GPA, as evidenced by the adjusted r-Squared value of 0.128 (see Appendix W). Specifically, the quantitative data exhibited linearity, multivariate normality, normality of residuals, homoscedasticity, and there was no evidence of multicollinearity (see Appendix T for detailed tables and figures from SPSS.

Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Bea	t	Sig.	Tolerance	VIF
	(Constant)	3.619	.133		27.258	.000		
	For the following statements about your higher education experiences, please select your level of agreement. – My first year (freshman year) was difficult.	-.070	.027	-.209	-2.611	.010	.960	1.041
	As a university student, was your assigned discipline your first choice? – Selected Choice	-.189	.074	-.206	-2.565	.011	.955	1.047

		-.017	.008	-.160	-1.989	.049	.950	1.053
	For the following statements about your career goals and life after university, please select your level of agreement. – When I look back at my undergraduate education, I wish I had studied something else.							
5. Dependent Variable: Please state your undergraduate GPA.								

Table 5. SPSS Output Table for Multiple Linear Regression

Summary of Data

Overall, this chapter presents a profile of partic6ipants who persisted in higher education. I highlighted factors that seemed to impact women's ability to not only get admitted into an institution of higher education, but also enjoy their experience, achieve relatively high grades, and graduate. The qualitative profile of the most successful student seems to be middle-to-upper class, with an exceptional secondary education and cultural capital in the form of university-educated family members. The interviewees who did not fit this profile—especially Alem and Liat—were also from rural areas of the country, which shows that being from rural areas seems to make students academically disadvantaged. Above all, interviewees did not want to be associated with low-achieving, female students. While students never explicitly stated this, most participants in the first phase of the study were somewhere along the spectrum of hostility or indifference toward a pronounced female identity. A total of nine Chi Square analyses showed a statistically significant association between categorical and scale data (a significance level of α = 0.05). The quantitative data demonstrates that perception of difficulty during their first (freshman) is the strongest predictor of performance once people enter higher education. Other statistically significant predictors of college GPA were the alignment between a student's assigned discipline and personal preference, and overall satisfaction with college major.

Discussion of Findings

Cumulatively, these findings show that multiple social, political, and economic circumstances have framed the experiences of women studying science and technology in

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Ethiopia. A thematic analysis of interview data, and parametric tests of quantitative data revealed two broad categories of findings—internal factors related to persistence and external factors related to persistence. Moreover, these categories of findings suggest three important ideas about the conditions for women's persistence in higher education.

Firstly, these findings suggest that higher education institutions treat female students monolithically. This is even though women tend to enter universities with diverse experiences, backgrounds, and demographic details. Differences in parents' education level, socio-economic class, and secondary education shape how each woman engages with various aspects of college life. The details of participants' backgrounds also influence how comfortable they feel with foregrounding their gender identity (as a woman) while they are on campus. Notwithstanding this in-group diversity, participants in this study often encountered student affairs programming, curriculum, and college access policies that treated all women in higher education as members of a universal group. In viewing students monolithically, university administrators and Ministry of Education officials have missed a valuable opportunity to meet the real (rather than perceived) needs of women as they navigate their undergraduate careers.

Secondly, these findings demonstrate the negative consequences of institutional massification in Ethiopian higher education. Many of the critiques that participants had regarding their years in college could often be traced back to the rapid expansion of public higher education in the last three decades. Examples included, frustrations with limited course materials, overcrowded laboratory classes, and cramped residence halls that often ailed women. If education leaders are serious about supporting the persistence

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of women, then they should also reckon with the long-term impacts of massification. As women in this study demonstrated, the quality of education in public higher education seems to be compromised as universities have increased in number in a short period.

Thirdly, the findings of in this study reveal some of the epistemological ideologies that are embedded into the organization and governance of public higher education in Ethiopia. Women's narratives about their teaching and learning often highlighted the ways in which a neoliberal, European/North-American male way of being was assumed as normal. Additionally, there was an emphasis on the importance of the market-returns of education, the preeminence of certain disciplines (such as medicine), and the privileged position of the English language. Considering how universities are designed to be sites of knowledge production, these deeply politicized epistemologies are problematic. Oftentimes, these embedded ideologies were so subtle that they were even internalized and enacted by participants, even when these ideologies were oppressive to women. Moving forward, these findings illuminate possibilities of how to transform education policy and practice in a way that would help more women persist.

Chapter 5: Recommendations and Implications

After collecting and analyzing data for this study, it is evident that women's experiences in science and technology are incredibly complex. Relative to other women in higher education, the participants in this study have done well in their university careers. Many are part of an elite, privileged class of students who have managed to navigate an exclusive system of education that does not promote the success of women. Drawing on their own sense of agency, these women ignored the imbalance of power that characterizes the learning and social environment, and found ways of succeeding within it. Meanwhile, many other women in this study come from disadvantaged socioeconomic backgrounds and managed to succeed within higher education despite limited access to wealth and social capital. Such women who displayed tremendous resilience while enrolled in university, often acknowledged the salience of gender and managed to persist in higher education despite the many obstacles in their path.

Notwithstanding this complexity among study participants, the themes that cohered in the analysis suggest certain recommendations. While these recommendations are written with university leaders and government officials as the target audience, these recommendations are designed to benefit future female students. In this chapter, I present three categories of recommendations that could be implemented in student affairs programming, course curricula, and university-access practices. While imperfect, these

three groups of recommendations emerged as a response to study participants' lived experiences. Some recommendations are better suited for privileged women like "Aida," while others are more useful for women represented by the "Desta," and some recommendations apply to all women in the study (see Figure 8 below for a visual representation of this delineation). If implemented synergistically, these strategies might help universities go from having compositional—and largely symbolic—gender diversity to substantial gender diversity (Celis, Childs, Kantola, & Krook, 2008; Childs & Krook, 2009).

RECOMMENDATIONS FOR HIGHER ED INSTITUTIONS

Student Affairs Programming
- scope of the campus gender office
scope of first-year orientation
- redesign of residence halls

Teaching and Learning Strategies
- research in local languages

College Access Practices
- tracking
- affirmative action
- massification

Teaching & Learning
- problem based learning
- digitizing course materials

Teaching and Learning Strategies
- internship requirements
- National Consortium for Excellence in Engineering

● BASED ON THE EXPERIENCES OF "DESTA" ARCHETYPE   ● BASED ON THE EXPERIENCES OF ALL STUDY PARTICIPANTS   ● BASED ON THE EXPERIENCES OF "AIDA" ARCHETYPE

Figure 8. Summary of Recommendations Based on Student Archetype

As I present each recommendation, I also explain how postcolonial feminism is a useful discursive tool for disrupting the status quo of women's access to, as well as persistence in public higher education. Thus far in the study, this critical theory has informed the study method (in that the narratives of the women guided the creation of the 50-item survey that was widely distributed) and integrated mixed methods analysis. By helping me frame the lives of women's educational lives through "…historical and cultural specificity," (Mohanty, 2013, p. 967) postcolonial feminism has helped me reframe how I examine gendered aspects of higher education, and new possibilities for feminist consciousness and liberation.

Recommendation 1: Reframing Student Affairs Programming

Reframing the role and conditions of student affairs programming is one way to promote persistence of women in public higher education. In hierarchical societies like Ethiopia, where the authority of faculty members is highly respected, student affairs programming might seem like an auxiliary part of the university experience. However, a redesign of student affairs services, especially when students live on campus because they do not have family in the same city, has the potential to help women stay enrolled. By responding to the actual material needs, rather than the perceived needs of women, student affairs professionals can acknowledge women as "…material subjects of their own history" (Mohanty, 1988, p. 65). This is to say that student affairs services that target women can become more meaningful by addressing the reality of women's lives on campus, rather than stereotypes of what women want and need. As demonstrated by data in this study, many women found their first year of university education to be quite

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formidable. Multiple interview respondents—like Abigail, Eskedar, Nardos, Tiya, Selam, and Sewit—described their first year as particularly challenging. Similarly, 58.4% of survey respondents reported that their first year was difficult by selecting "Agree" or "Strongly Agree" when prompted by a Likert-scale question. Moreover, the strongest predictor of women's undergraduate GPA is the perceived difficulty of their first year of college (see Table 13). Thus, student affairs programming has the potential to ameliorate this difficulty. However, for this to take place, programming should no longer be infantilizing, condescending, or reductionist.

More specifically, student affairs professionals should design and implement intersectional campus programming for women in their first year of college. Services must recognize how other hegemonic power structures—such as class hierarchy, ethnocentrism, and urbanism—interact and shape the experiences of women once they get to a college campus. This is particularly important for women who share the personal histories and life experiences of "Desta" because they often feel the brunt of multiple forms of oppression, in addition to sexism. Furthermore, student affairs professionals must demonstrate an ethic of care (Noddings, 1995) when delivering support services. The demonstration of care in an academic setting is not anti-intellectual. In fact, the perceptible loyalty of Nazareth School alumni, who cite its communal ethos as one of the aspects of the school they highly valued (Agedew et al., 2017), shows that an ethic of care and academic achievement are not mutually exclusive. In the next three sub-sections, I argue that three distinct areas of student affairs programming, gender offices, first-year

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orientation, and on-campus housing, should be reframed to better address the needs of women on campus.

Reimagining of the scope of the campus gender office. Each public university in Ethiopia is mandated by the Ministry of Education to have a gender office. These units are designed to promote inclusivity by providing academic, social, and personal support to female students (Molla, 2013b). While these campus offices are important, the conditions surrounding their current use do not support women in an optimal way. While individual students like Alem (based on Interview 3) and Tiya (based on Interview 3) found these units helpful, many other study participants (54.6% of survey respondents), did not find the gender offices useful.

Women may not utilize these offices may not be utilized by women in part because they tend to depict women as excessively young and weak. In doing so, gender offices discursively force women into a perpetual "object status," in which oppression is constantly happening to them (Mohanty, 1988, p. 66), instead of them operating as independent actors within an oppressive setting. A prime example of this discursive process is an artifact from this study—a brochure from the AAU CNS gender office (listed in Table 3). This brochure was provided to me by gender office staff when I first began my data collection. As I flipped through this document, I found language that tended to trivialize women's negative experiences in education. For instance, a few excerpts from this document explain that the aim of this unit is to "Look for possible financial support for *needy* female students," and to "…minimize the *vulnerability* of female students and staff to sexual and reproductive health problems including

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HIV/AIDS" (emphasis added). The brochure also includes photos of current students, and one of the captions describes "female students in *girls* reading room" (emphasis added). While none of these examples of gender office programming are inherently wrong, they are still imbued with reductionist messages about the population being served. It appears that students' female identity is conflated with disability, poverty, and immaturity (i.e. referring to students as girls instead of adult women). In this campus setting, the gender office staff must consider not just the specific services that are offered, but also how the messaging regarding those services is being communicated. These small, yet pointed messages, cohere into a campus culture that negates the competence of women.

The first step in reframing the role of each institution's gender office should be renaming these units. Instead of the current opaque title (which does not explicitly reflect the resources it offers), these offices should instead be called "Women's Resource Centers" or "Academic Resource Centers." Adding specificity to these names of these units might assist in de-stigmatizing them. Working alongside other university administrators, gender office staff should also periodically reevaluate the messaging (as shown in brochures, flyers, ads, events, etc.) that come out of this office to make sure that it is not problematic and does not presents a condescending view of womanhood.

Next, gender offices should develop programming that is directed toward male students. While study participants did not articulate an explicit desire for student affairs programming for men, their experiences suggest that higher education institutions' practices and norms were established based on male normativity. Thus, creating critical programming that is directed to men would help more members of campus of each

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campus community develop an expansive view of gender. For example, since beliefs about masculinity or hyper-masculinity might contribute to, and exacerbate violence against women on campus, men on campus should be asked to participate in seminars about sexual assault. In the neighboring country of Kenya, secondary schools have adopted a similar strategy for preventing rape among female students. Through the multi-school program called "Your Moment of Truth," male students are required to complete bystander training to be used when they witness violence committed against female students (Migiro, 2015). Using the program in Kenya as a model, gender offices in Ethiopia could develop age-appropriate programming that promotes gender equity as a pertinent issue for all university community members, not just "vulnerable" and "needy" women. Similarly, student affairs professionals could support and amplify the work of existing feminist groups, like Addis Ababa University's "Yellow Movement" or the local grassroots organization, "Setaweet." The Yellow Movement, started by law lecturer, Blen Sahilu, and two law students (Hilina Berhanu and Aklile Solomon), is a student group dedicated to raising awareness about gender-based violence and preventing sexual assault on campus (L. Robinson, 2017). While this organization is commendable for its advocacy work, it is housed at the faculty of law of Addis Ababa University—making its usefulness limited to women on other campuses. However, it can serve as a model program for other student-focused organizations and education initiatives. On the other hand, Setaweet is a small research and training company based in Addis Ababa. Led by Dr. Sehin Teferra, Setaweet (the name of the organization is the Amharic word for "feminist") aims to advance gender equity and promote a feminist movement in Ethiopia

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through corporate trainings, gender-focused workshops, and research services (Sehin Teferra, 2018). By using entities like Setaweet as a paradigm, university gender offices could craft student affairs programming that support women and be the springboard for feminist student movements. Such campus programming should also emphasize how gender hierarchies and power are linked, and how they tend to protect and reproduce one another.

The spatial positioning of gender offices must also be changed. If the wellbeing of minority students, like women, is an institutional priority, then the offices designed for these students must be in a central location of campus. Conversely, positioning the gender office in a far-flung corner of the university or near the source of an odious smell, like in the case of the AAU CNS campus, is troubling. If the scope work of campus gender offices is to be wider and more impactful, then these offices must be physically moved to an area of campus that is easily accessible and visible.

Working in tandem, these efforts might help frame the work of gender offices for what they were theoretically designed to be—epicenters for equity and inclusivity. Being female is not a condition that warrants shame or pity, therefore, the units on campus that attend distinctively to "female issues" need not treat women as children or victims. Overall, the programming coming from the gender office should normalize the presence of women and acknowledge that there is variation among them. Such shift in framing will not only incentivize more women to tap into the services offered by this gender offices but will also encourage a more expansive view of gender across campus.

Over time, such an expansive view of gender might also contribute to a public conversation about moving beyond the gender binary and embracing lesbian, gay, bisexual, and transgender, and queer (LGBTQ) rights in the country. According to Equaldex (2018), a knowledge base company that compares LGBTQ rights in different countries, Ethiopia ranks among the lowest in the world. Homosexuality is illegal in the country (punishable by imprisonment), and there are no legal protections for individuals who have faced discrimination in employment, housing, and marriage based on sexual orientation. At this moment in Ethiopia's history, starting an explicit conversation about LGBTQ rights would likely be emotionally volatile, or perhaps even violent. However, expanding notions of what it means to be a woman, through strategic and critical programming from university gender offices, might help us reach that conversation sooner.

Reimagining of the scope of first-year orientation. One of the functions of first-year orientation is to establish norms for student conduct and set the precedent for an inclusive campus culture. Similar to their underutilization of campus gender offices, public universities have not optimized first-year orientation programs. Interviewees like Fanta, for instance, did not find orientation helpful because there were "…like thousand and 800 people in one auditorium. So it was like if you were sitting at the back, definitely you weren't listening," (Interview 2). Survey respondents, meanwhile, *did* find freshman orientation helpful: 53.3% responded "Agree" or "Strongly Agree" when asked to state their level of agreement with the statement, "Freshman orientation was helpful." As universities continue to conceptualize ways of advancing gender equity on their

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campuses, they should keep in mind the critiques of students like Fanta and a sizable portion of survey respondents.

One way to improve first-year orientation is to ensure that all students in a cohort are not participating en masse. Parceling out an incoming class into smaller orientation groups would allow students to process the information that is provided, as well as give them a chance to make meaningful connections with other incoming students. Student affairs professionals and faculty should also consider collaborating to design first-year seminar courses that align with students' orientation groups. U.S. universities, like the University of Denver (2018), have implemented this type of integrated orientation program for first-year students, and they appear to benefit students. In this integrated programing, student affairs professionals and faculty could frame the many elements of campus life that are gendered, such as narratives of sexual assault or sexism that plays out in the classroom. Orientation groups might also provide a better setting for retention initiatives, like the Undergraduate Success Program (USP). Bisserat and Eskedar explained that this initiative at Addis Ababa University helped them during their time in college by providing safe spaces for discussion and academic tutoring (Interview 2). Additionally, elected student leaders could bring the concerns of mentoring groups to the attention of student affairs professionals. Currently, the students of each major in every cohort selects a student leader to act as a liaison between students and faculty. For example, Sewit and Fanta shared that they were the chosen engineering representatives for their cohorts at Bahir Dar University and Addis Ababa University IST campus, respectively. Building on this existing practice, universities might also consider assigning

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orientation group liaisons that communicate with faculty and staff about issues that pertain to gender equity.

Additionally, first-year orientation initiatives should draw on what is already important to female students, such as religious identity. This type of student affairs programming would be more effective in meeting the needs of marginalized students because it would be intersectional. For women in Ethiopia, an intersectional approach to addressing oppression in higher education is paramount. Crenshaw (1991) posits that "…when one discourse fails to acknowledge the significance of the other, the power relations that each attempts to challenge are strengthened" (p. 1282). Keeping this analysis in mind, student affairs professionals must consider the salience of other identities, and the power they are rooted in, when designing first-year orientation programs. To this end, responses from the survey in this study provide us with insight. For instance, when asked to rate the statement "Growing up, my religion was important to me," 83.2% of respondents replied "Agree" or "Strongly Agree." Moreover, asked to disclose their religion, the majority of respondents (67.6%) said that they are Orthodox Christian, while the rest identified as Protest Christian (19.6%), Muslim (7.8%), or Other (4.9%). Piecing these data together, student affairs professionals might consider incorporating modules about religious plurality into first-year orientation. This sort of intentional programming might help students at the intersections of multiple marginalities—like Muslim women on campus—feel more seen and respected on campus. Women were not a uniform group prior to their entry in higher education, and as a result each woman is confronted with distinct problems and needs that are addressed

with specific interests and goals. Without specific, intersectional programming, student affairs professionals risk homogenizing—and thereby discursively colonizing (Mohanty, 1988)—women's political interests.

Finally, first-year orientation programming could be strengthened with multi-modal communication. If institutional values about gender equity are introduced during orientation, these values need to be re-communicated and reinforced throughout the rest of the academic year. In this regard, universities can strategically use social media platforms like Facebook, Twitter, and LinkedIn. As the methods chapter of this study demonstrates, social media is an effective way to reach female students in Ethiopian higher education. Since consistent internet connectivity may be prohibitive for the use of social media, especially in rural regions, student affairs professionals could also rely on low-bandwidth communication apps such as WhatsApp and Zoom. Alternatively, the use of text-messages—if students disclose their cell phone numbers to university staff—is another way that important ideas from orientation can be reinforced to students. To create a substantial shift in campus culture, student affairs professionals should be leveraging these platforms to frame and normalize inclusion for women in higher education.

Redesign of on-campus residence halls. Current conditions in campus-residence halls are not conducive for the persistence of women in higher education. Interviewees like Eskedar and Bisserat, who lived together during their first year at Addis Ababa University IST, shared a room with sixteen other women. When explaining the conditions of her overcrowded residence hall, Eskedar pointed out, "You just have space to jump into your bed and to get off your bed. That's all" (Interview 2). Similarly, Selam

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described how difficult it was to live in the AAU CNS residence halls. She explained that she decided to temporarily forego on-campus housing "Because a dormitory, it's very ugly. I didn't expect it. Actually…even in spring, it's so hot. Even I didn't stay in this dormitory for one or two months and – it's so hot. It's so – I don't know. It's hot a long time" (Interview 2). Meanwhile, interviewees like Abigail (Interview 2), Fanta (Interview 1), and Nardos (Interview 2) said that they preferred to live at home with family, even though they had an opportunity to live on campus. The anecdotes and preferences from study participants like Eskedar, Selam, and many others underscores the need for improving on-campus housing. Existing living conditions are not conducive to student persistence because the residence halls are not spacious or comfortable enough. Thus, student affairs professionals should keep such experiences in mind as they consider ways of redesigning residence halls.

The first step in improving on-campus housing for female students is expanding the number of residence halls. The overcrowding of residence halls is a major issue in Ethiopian higher education, highlighted by both extant literature (Semela, 2007) and study participants. Thus, building more housing units on campus is an important action that universities can take to support, and hopefully retain, enrolled undergraduate women. Since physical space—for outward expansion—may be difficult to find in rapidly urbanizing areas like Addis Ababa (Gardner, 2017a), campus leaders should consider the expansion of housing by building up, instead of out. Developing high-rise residence halls on campuses like AAU IST, AAU CNS, Bahir Dar University, and Hawasaa University might be more feasible than expanding into the surrounding cities. For institutions like

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Aksum University or Jimma University, which are in less densely populated cities, outward expansion of the physical campuses to accommodate more residence halls might be more feasible.

Recommendation 2: Revitalizing Teaching and Learning Strategies

A second important step in promoting the persistence of future female students is through a revitalization of teaching and learning strategies on university campuses. Modifying curriculum and pedagogy is one way to immediately address the concerns that participants have voiced during this study. By directly addressing the concerns of female students, faculty and institutional leaders can engage in localized, specific praxis (Mohanty, 1988). Higher education cannot do much about what has already happened in students' primary and secondary education, but it can address how students engage with the institution. A revitalization of teaching and learning would not require a complete overhaul of existing modes of curriculum and pedagogy. That would be impossible. Instead, current practices should be modified to better meet the needs of women. There is exciting room for growth in this area because changes to teaching and learning can be more easily implemented across different campuses, as compared to more resource heavy-recommendations like adding more residence halls. Reform in this area would also help stabilize newer, fledgling universities that may suffer from a shortage of faculty members.

Ultimately, this reconfiguration of teaching and learning needs the buy-in of existing faculty. As Tamrat and Teferra (2017) point out, there is an increasing tendency of public university management to be carried out using business models, much to the ire

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of people who do not feel motivated by business process outcomes. Moreover, policy changes have been made at the highest levels of administration. One of the effects of this shift in leadership is that internal stakeholders, like faculty, have often been neglected from the decision-making processes of academic governance. Moving forward, faculty should be involved in all stages of any redesign of teaching and learning. If faculty members are trusted to spearhead these changes, there is a potential to restore some of the agency that has been lost, as public universities have been gradually governed like hierarchical business, instead of entities for the public good. In the following subsections, I highlight five dimensions of teaching and learning that can be revitalized, these include: increased use of problem-based learning, formalization of internship requirements, digitization of course materials, promotion of peer-reviewed research in local languages, and the establishment of a National Consortium for Excellence in Engineering.

Increased use of problem-based learning. In this study, students often mentioned the merits of interactive pedagogy that helped them develop practical skills. For example, 68% and 53.4% of survey respondents replied with "Agree" or "Strongly Agree" when asked to rate the statements "In university lecture courses, I enjoyed interactive activities," and "In university lecture course, I learned practical skills about my discipline." When students did not have access to this applied learning, their academic performance suffered. Yeshi, for instance, lamented the disconnect between what she learned in university lecture courses and what she was tested on. She recalled: "It's like – it's almost like some students were supposed to be reduced. Sometimes it felt that it was on purpose that the exams were so difficult because what you cover in the

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classroom and what the exam is about was totally different" (Interview 2). During the same interview, she attributed this disconnect to the lack of practical engineering skills she was taught during her time at Hawassa University. To help more women like Yeshi make the connection between theoretical and practical knowledge in science and technology curriculum, faculty at public universities should consider implementing problem-based learning (PBL).

First used in medical education to train clinicians, PBL is a student-centered pedagogical strategy that makes an open-ended problem the focus of instruction. Instructors who use PBL typically assign students to groups, present each group with a problem related to course content, and then evaluate student performance based on collaborative findings (Woods, 2018). Within-group accountability can be established in PBL if instructors incorporate students' evaluation of one another's performance into individual grades. For instance, if an instructor assigns a group of five students a PBL assignment, then a part of each individual student's grades can come from how the other four people in the group assess her performance. In science and technology classrooms in Ethiopia, PBL can help students not only be active in the kinetic sense, but also helps them integrate the information they have learned from lectures and course readings. Thus, PBL can support female students, who seem to value interactive activities and the acquisition of practical knowledge, as they take challenging, advanced courses like Statistical Inference (mentioned by Tiya, Interview 2), Oncology (mentioned by Melat, Interview 2), or Statistical Distribution (mentioned by Selam, Interview 2).

Additionally, PBL might help students develop their "absorptive capacity." Traditionally used in management literature when discussing organizations, individual absorptive capacity is a person's ability to absorb, or "…identify assimilate, and exploit knowledge from the environment" (Cannon, Geddes, & Feinstein, 2014, p. 378). Since PBL requires that students engage in critical thought in multiple steps (i.e. defining the problem, determining what background knowledge they already have about the problem, assessing what potential solutions exist for the problem, discussing the merits or limitations of certain solutions with their peers, etc.), this pedagogical strategy can help students identify and assimilate more knowledge while working in teams. Relatedly, PBL is an important way that faculty can promote mixed-ability learning. In each PBL group, different students come to the table with diverse areas of content knowledge, academic preparation, and personal expertise for a given subject matter. Since collaborative work and knowledge sharing is rewarded in PBL projects, students with different levels of mastery come together and engage in peer-to-peer instruction. Previous research (Cohen & Lotan, 2014) has shown that this type of mixed-ability grouping helps students, particularly minority students, perform better.

Formalization of internship requirements. The current public university curriculum can also be enhanced by the formalization of internship requirements for undergraduate students. Per the quantitative survey, 65.35% of respondents completed an internship during their university career, which might indicate that internships are an important milestone for students at public universities. More explicitly, 73% of survey respondents replied "Agree" or "Strongly Agree" when posed with the statement "Long-

term internships (1 year or longer) would have increased the quality of my undergraduate education." Likewise, interviewees who participated in internships, spoke highly of these formative experiences. Sewit, for example, seemed to greatly appreciate her engineering internship at a hydroelectric power station. During our second interview, she recounted how she and other interns were present during the dam's construction:

> We were just very lucky to be able to be there when that was happening. So everything else, we would have seen this on either videos or just conceptually. So it was really cool to really see how – not just electrical part, but how all other engineering fields come together. So you need civil engineers, you need mechanical engineers, you need electrical engineers to be there…And it's a huge project. This is a huge infrastructure. Amazing.

If such narratives from Sewit are indicative of the utility of undergraduate internships, then internships should be more highly prioritized as an integral part of the teaching and learning process.

To accomplish this, there should be academic units on campus that assist women in searching for and securing long-term internships. Currently, students are responsible for independently finding organizations to intern with, as noted during conversations with Eskedar and Nardos (Interview 2). To ensure that more women have access to these formative learning experiences, each public university should establish an Office for Academic Internships, in which student affairs professionals serve as liaisons between current students and external companies that are looking for interns. With the help of these professional liaisons, engineering, chemistry, and biology majors could intern at

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pharmaceutical companies, industrial firms, manufacturing agencies, and technology-based start-ups. Alternatively, federally protected geographical sites—like the Simien Mountains, Awash National Park, and Danakil Depression—could be the internship sites for geography majors interested in conservation careers. These industries, among many others (see potential placements listed in Table 15, on the following page), could potentially benefit from the skillsets and innovative ideas of emerging science and technology professionals at public universities. Since women have traditionally been excluded from the public sphere in patriarchal Ethiopian society (Burgess, 2013a; Kedir & Admasachew, 2010), internships at organizations like these could provide a vital inroad into the professional world for underrepresented women. In addition to facilitating internship placements, student affairs professionals and faculty should develop a standardized assessment form that partner organizations fill out based on each intern's performance. Study participants like Sewit (Interview 2) and Nardos (Interview 2) indicated that the only evaluation they received after finishing their internships were letters of completion from their supervisors. Moving forward, it would behoove both universities and partnering organizations to have clearly defined rubrics for competencies that interns should be developing.

Company/Organization (Private and Public Sector)	Industry Focus	Required Skills	Corresponding Major(s)
Duka Interiors http://dukainteriors.com/index.html	Interior design	Animations, graphics design, furniture design	Architecture, Computer Engineering, Software Engineering
Deliver Addis https://deliveraddis.com/	Food	App development	Computer science
ETTA Cabs Addis https://www.ethiopiataxi.com/	Transportation (app-based)	GIS mapping	Geography, Computer Science

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Ethio Telecom http://www.ethiotelecom.et/	Mobile and internet technology	Information management	Information Technology
Federal HIV/AIDS Prevention and Control Office http://www.hapco.gov.et/	Public health	Epidemiology, lab-based competencies (assays, microbe identification, etc.)	Microbial, Cellular, and Molecular Biology
Federal Ministry of Water, Irrigation, and Electricity http://www.mowie.gov.et/	Agriculture and infrastructure development	Spatial analysis, city planning	Plant Biology, Biotechnology, Geology
Hello Doctor http://www.hellodoctorethiopia.com/version2/	Public health	Medical diagnosis, telecommunications	Information Technology, Medicine
Population Council http://www.popcouncil.org/research/ethiopia	Demography, public health	Survey design, quantitative analysis	Information Technology, Statistics, Mathematics

Table 6. Potential Internship Sites for Undergraduate Students

Finally, internship placements should incorporate formalized entrepreneurship training. This recommendation is based on survey item that prompted respondents to rate their level of agreement with the statement, "People who study science/technology should also take business/entrepreneurship courses." Nearly all respondents (86.5%) selected "Agree" or "Strongly Agree" to this question, which implies that entrepreneurship and business management are skillsets that many female science/technology majors are interested in developing. In the context of a burgeoning market economy in Ethiopia that often rewards small-business owners (Toure, 2016b), it is reasonable that students are seeking out opportunities to grow in this area.

Digitization of course materials. Digitization of course materials is another way to improve the teaching and learning for women in public universities. Study participants repeatedly remarked on the insufficiency of course materials in higher education. For example, Yeshi (Interview 2) explained that a shortage of library books at Hawassa

University necessitated that students check out texts for only a few hours at a time. She explained:

> There weren't enough books to read, so there were like maybe three reference
> books for, I don't know, 100-something students. Like you have to go early in the
> morning, you know. You had to take – you write your name from – I don't know
> – for 10:00 to lunchtime and stuff...Otherwise your other option is to either buy
> the book, which was expensive at a student level…

Interviewees like Liat (Interview 2) and Melat (Interview) also cited how they spent money out-of-pocket to make photocopies of course materials. In addition to possibly violating copyright laws (Tsegaye, 2012), the reliance on printed texts and photocopying creates an unnecessary bottle-neck and financial burden for students. To alleviate some of the strain of limited course materials, universities should consider moving toward digitizing course materials. This type of change would meet the context-specific, material needs of women—a necessary component of the postcolonial feminist ethic (Mohanty, 1988).

To start, information technology professionals on campuses (like librarians and archivists) should scan and upload existing course documents and key reference books to a digital repository. This would be helpful to students who can then access these materials on demand, from a computer or smartphone, instead of relying on a physical copy. Since limited internet connectivity may constrain utility of online databases, archivists could also create a catalog of flash drives/CDs (that have been loaded with the electronic copies of texts), or password-protected PDFs that students could use.

Certain faculty members are already practicing this method for disseminating course materials. For example, one of the instructors for the course, "Mathematical Methods of Physics II" (taught at the AAU CNS campus during the spring 2017 semester, see Table 3) provided each student with an electronic version of the 565-page text book. Meanwhile, interviewees like Abigail (Interview 2), Eskedar (Interview 2), and Bisserat (Interview 2) noted that they also took classes where the professor provided a soft copy of the text. As universities continue in their efforts to promote the persistence of women, they should utilize technological strategies like these to make knowledge more accessible for students.

Promotion of Peer-Reviewed Research in Local Languages. Along the same lines, more peer-reviewed work needs to be published in-country about local developments in science and technology disciplines. Currently, there are three peer-reviewed academic journals that publish research in Ethiopia. These are:

- *African Research Review* - headquartered in Bahir Dar, Ethiopia, and focuses on research about economic development.

- *Journal of Ethiopian Studies* – headquartered at the Institute for Ethiopian Studies in Addis Ababa, and focuses on interdisciplinary social science and historical research.

- *Ethiopian Journal of Higher Education* – headquartered at the Institute of Educational Research of Addis Ababa University.

While these three periodicals are integral, they highlight only humanities and social science research. Thus, there seems to be a gap in knowledge and information sharing for

empirical work in science and technology periodicals. This dearth may be due, in part, to a lack of telecommunications infrastructure or advanced laboratory machinery in the country. Moving forward, faculty and researchers at public universities should strengthen higher education curriculum by producing and disseminating empirical research in local journals. In addition to promoting knowledge sharing between institutions, this move could create research opportunities and active learning experiences for women in higher education.

Logistically, the production of science and technology focused journals could take place through collaborations between individual academic departments in Ethiopia and external, well-resourced organizations that have a vested interest in producing knowledge about the country. By leveraging strategic relationships, universities in Ethiopia could maximize financial support while organizations outside of Ethiopia could maximize visibility and impact. For example, the Department of Materials Science and Engineering at Jimma University—ranked as one of the top research institutions in sub-Saharan Africa (West, 2015)—could potentially partner with Tsehai Publishers (an Ethiopia-focused production company housed at Loyola Marymount University in Los Angeles, California). Working together, representatives from Jimma University and Loyola Marymount University could craft an online periodical about recent developments in materials science and engineering. Likewise, representatives from the renowned College of Agriculture and Environmental Science at Haramaya University could partner with the African Studies Association (headquartered at Rutgers University in New Brunswick, New Jersey) to launch a special publication series about agricultural developments in

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Ethiopia. Similarly, academic physicians from Addis Ababa University's Black Lion Hospital could work with faculty at the University of Hamburg (which offers a graduate degree in Ethiopian Studies) to establish a journal of medicine. In all potential collaborations, faculty and staff should be intentional about selecting women students to be part of the research and publication process.

Furthermore, these academic publications should be written in local, indigenous languages. If the goal of public education is to meet the needs of the country in which these students live in, then education and academic research should be delivered in languages that they understand. While majority of the interviewees in this study (particularly those reflected in the "Aida" archetype) had a strong command of the English language, their fluency in this language is not representative of most female students enrolled in public universities (Molla, 2018a, 2018b; Taye, 2018). Reforming higher education practice to ensure that Ethiopian languages are used for instruction is one way to ensure that the onus of educational change is put on higher education institutions, rather than on marginalized students. Moreover, in Ethiopia, media outlets, government, and many professional spheres tend to be conducted in local, Ethiopian languages like Amharic, Tigrinya, and Oromiffa. The use of English in classrooms and research also distracts from the substantive content being examined. Since the use of English is inconsistent with the larger societal context of a typical university student's life, it should no longer be the primary language used in higher education. This recommendation would also necessitate that academic journals typically housed at universities, like the *African Research Review, Journal of Ethiopian Studies*, and any

future science/technology focused periodicals that may emerge in Ethiopia, should not be written exclusively in English. To accomplish this on a wider, digitized scale, universities should leverage the research of scholars like Isabelle Zaugg (2017), who examines efforts to include Ethiopic script into popular coding software.

Producing original, empirical research in Ethiopia, by Ethiopian investigators, in local languages is perhaps one of the most socially liberating reforms that can happen in teaching and learning. Mazrui (1997) reasons that the use of African languages is a fundamental part of intellectual self-determinism. More specifically, Negash (2006) that in Ethiopia, there has been a rejection of the traditional ethos in education, and that needs to be recovered. This scholar goes on to claim that , "…the most viable strategy for the reconstruction of Ethiopian education is the privileging of national languages as media of instruction for all levels of education including at the university level" (p. 41). As previous scholars have shown, language is politicized, and the use of certain languages in the academy is laden with political meaning. In postcolonial feminist scholarship, the tendency to use the epistemology, histories, and culture of a dominant group as the norm, while codifying subordinate groups as Other, is inherently oppressive (Mohanty, 1988). In this work, I attempt to disrupt this deference to the West (although I fall short, in many cases). In keeping with this postcolonial feminist tradition, I recommend moving away from the use of English in the academy. English is not any more academic, credible, or useful than any indigenous, Ethiopian language. On the contrary, the use of Eurocentric languages, like English, is a relic of colonial plunder of the African continent. Pankhurst (1972), for instance, points out how fascist colonial policy during the Italian occupation

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of Ethiopia mandated that Italian would replace Amharic as the official national language. In keeping with postcolonial feminist thought, higher education leaders should extend the work of resistance to the modern day by indigenizing the language of the university teaching and research.

        National Consortium for Excellence in Engineering. Finally, teaching and learning at public universities could be bolstered through the establishment of a National Consortium for Excellence in Engineering (NCEE). As the findings from this study demonstrate, most study participants studied engineering: six out of 14 interviewees were engineering majors, while 72 out of 204 survey respondents studied engineering. The sizable proportion of engineering majors in this study suggests that a consortium that focuses on this field might be useful for future cohorts of undergraduate students. The overrepresentation of engineers in this study is also extremely important to note, considering previous research about women's participation in higher education. Tamrat (2017) reports that women (in both public and private) higher education tend to have the highest participation in medicine and health sciences, where they make up 42% of students. Meanwhile, they have the *lowest* participation in engineering, where they make up only 29% of students. Since the bulk of the participants in this study shed light on the women who are least represented in science and technology disciplines, a possible institute like NCEE is sorely needed. Ideally, the NCEE could facilitate faculty development, host pedagogical training for graduate students interested in the professoriate and serve as a hub for academic research and resource exchange. In accomplishing these aims, this institute should make gender equity an integral value and

a measurable outcome. Since Addis Ababa University tends to better equipped, in terms of infrastructure and human capacity, the NCEE could be housed at the AAU IST campus.

Faculty development should be a priority in a unit like NCEE because of the toll that higher education massification (Girmaw Abebe Akalu, 2014; Molla & Gale, 2015; Tessema, 2009) has taken on the quality of teaching at public universities. Many institutions are severely understaffed, or have hired faculty with little pedagogical training (West, 2015). Researchers have also shown that higher education institutions in Ethiopia are disproportionally affected by the loss of academic staff and migration, underscoring the organizational capacity issues that universities face (Birbirsa et al., 2015). In response to this, public institutions like Bahir Dar University and the University of Gondar have collaborated with the United States State Department and the Institute for International Education to launch the Ambassador's Distinguished Scholars Program. The expressed aim of this program is to "…strengthen Ethiopian universities' capacity to teach and manage undergraduate and graduate programs and enhance research capacity within Ethiopian universities" (IIE, 2018). This aim is accomplished by bringing U.S. based faculty and senior scholars for visiting professorship positions in the humanities, social sciences, and STEM fields. The willingness of public Ethiopian universities to recruit professors from another country (and pay them handsomely, relative to local faculty) shows the severity of the faculty shortage. Thus, the NCEE could help address this serious gap in knowledge and practice by offering workshops, seminars, and extended trainings that help local professors strengthen their teaching practice. Perhaps

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faculty-training modules at the Massachusetts Institute of Technology and Stanford University (universities that interviewees like Abigail and Sewit described as aspirational for scholars in the engineering field) could serve as a template for the kind of professional development that could take place in Ethiopia. The Teaching and Learning Lab at MIT (2018), for instance, offers guidelines and seminars for course design, teaching, assessment, and evaluation. Likewise, the Office of the Vice Provost for Teaching and Learning at Stanford University (2018) supports instructors' work toward achieving core competencies, this includes: principles and practice of effective pedagogy, digital teaching and learning technology, learning environments, facilitating consensus, community building, and collective action. Keeping these models in mind, employees of the NCEE could help professors—and graduate students interested in faculty positions— achieve similar competencies, with a special emphasis on gender issues and the experiences of female students.

Furthermore, a country-wide institute like the NCEE could be used as a hub for sharing advances in engineering research and practice. For example, faculty like Dr. Ali Eftekhari—former director of Jimma University's Department of Materials Science and Engineering—could share recent research findings during a distinguished lecture series hosted by NCEE. This specific function of the NCEE could help mitigate the limitations of universities that face shortages in laboratory space, reagents, or equipment. In this study, qualitative data showed that multiple interviewees—like Fanta, Melat, and Nardos—were dissatisfied with their experiences in undergraduate laboratories. During

her second interview, Fanta, for instance, lamented how the overcrowding in her lab classes prevented her from paying attention. She recalled:

> And it's just like uncomfortable. Lab activities are normally uncomfortable. Because there are like a lot of people – a lot of students that want to know, but it's like this. He's showing something over here, right? The people at the back, if you're really short, you are like – you can't see anything.

Correspondingly, nearly one third of survey respondents (32.6%) disagreed or strongly disagreed with the statement "I learned a lot of information from laboratory courses." Such discontentment from study participants underscores the need for a different mechanism of laboratory-based learning. If faculty and researchers are unable to complete a certain experiment at their home universities due to limited space, reagents, or lab equipment, then NCEE could potentially fill that void by being a repository of study findings and methods. While this solution does not fix the underlying issue of insufficient laboratory infrastructure, the dissemination of empirical knowledge among faculty and researchers is a crucial starting point. Along the same lines, the NCEE could be the production headquarters of peer-reviewed academic journals that publish engineering studies in Amharic, Tigrinya, Oromiffa, and other local languages.

Recommendation 3: Reconsideration of Existing College Access Practices

The Ethiopian government has made tremendous financial investment in higher education. Currently, the country's tertiary gross enrollment ratio stands at 10.2%, which is markedly higher than the average rate of 6-8% for sub-Saharan Africa (Tamrat, 2017). While tenuous gains have been made towards women's participation in higher education,

specifically in science and technology, there remains much work to do. Moving forward, the Ethiopian government aims to increase women's representation in science and technology disciplines to 45% by the 2019-2020 academic year (Tamrat, 2017). While this target will likely not be reached, one way to move toward this goal is by reconsidering college access policies. Since higher education institutions are often risk adverse (Tamrat, 2017; Tamrat & Teferra, 2017), any changes to access policies would likely need to happen through external audits mediated by the Higher Education Relevance and Quality Agency, or HERQA.

To promote the persistence of more women in higher education, the language and scope of college access practices must be reformed to become more holistic and humanizing. As noted in the first chapter of this study and in Appendix B, existing policies—like the Education and Training Policy, the Education Sector Development Program Action Plan II, the Five-year Strategic Framework for Enhancing Women's Participation in Tertiary Education in Ethiopia, and Higher Education Proclamation No. 650—often focus on numerical representation of women and do not consider how they experience higher education. The data gathered in this study, especially the interviews, also sheds light on how problematic these practices are. Oftentimes, issues of power are ignored in the design and implementation of college access practices. This omission must be addressed if women are going to be meaningfully integrated into higher education. As Semela et al. (2017) explain, "At the most elementary level, however, policy makers may still need to consider taking measures that would help to integrate more women into mainstream academic life" (p. 17). In response to this caution, I recommend three

changes that should be made to college access practices. These recommendations, highlighted in subsequent sections, include: a reconsideration of academic tracking system, a reframing of the affirmative action policy for women, and a pause in university massification.

Reconsideration of Academic Tracking Systems. First, higher education leaders must modify the current academic tracking system so that standardized exam scores are no longer the primary determinant of which university a student attends and what she studies. As mentioned in the literature review of this study, students take the Ethiopian General Secondary Education Certification Examination at the end of 10th grade. This assessment is multiple-choice, and is based on nine content areas—Amharic, English, mathematics, physics, chemistry, biology, civics, geography, and history (Bekele et al., 2017). Students' performance on this exam determines whether they enter a pre-university preparatory track or the Technical and Vocational Education and Training (TVET) track. Analogously, at the end of 12th grade, students who have completed the pre-university curriculum sit for the National Higher Education Entrance Examination (NHEEE), which is also a multiple-choice test, with a scoring window from 200-700 points. Students' performance on the NHEEE largely determines which public university and major she is assigned to. While there are merits to this system of university admissions (e.g. a streamlined process), this system is troubling because of how the Ministry of Education interprets the NHEEE scores. As interviewees shared, higher NHEEE scores are tied to certain disciplines and certain institutions. For instance, Eskedar explained, during our first interview, that:

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you have to get about 450 to get into Addis Ababa University, civil engineering –

for civil engineering. It started from 450 and above for medicine. But if you – you

can go to engineering school if you have out of 400, but not in Addis Ababa. You

will go to other campus. Above 350 won't do as well.

Fanta echoed this hierarchy during Interview 1, as she elucidated:

usually, medicine – people who wanted medicine were having a hard time. The

engineering one, if you got above 440 or 460, you're good. You could go to Addis

Ababa and still get engineering. So it wasn't – I got above that. So I just got what

I wanted and I didn't have to face the scenario where I'm like, I wanted this, but I

didn't get this.

This hierarchizing of scores and institutions is troubling because it creates an inherently

flawed value system. For example, a student interested in studying agriculture at Hawassa

University may find it discouraging that her discipline of choice is considered less

rigorous (and therefore requiring a lower score) than a more "competitive" discipline like

engineering. More broadly, the current national-exam based tracking system imbues

medicine (as a discipline) and Addis Ababa University (as an institution) with too much

power. If a public university-bound student in Ethiopia is assigned to attend AAU and

study medicine, then there exists a subtext that she was one of the top-scoring students in

her nationwide cohort. This equivalency is problematic because medicine, as a field, is

not patently more useful, challenging, or rewarding than other, lower-ranked fields, like

geology or engineering. Related to this, I noticed that multiple interviewees—namely,

Feven, Selam Tiya, Yeshi—stated that they did not want to study their assigned major but

wanted to pursue medicine instead. Similarly, among survey respondents who *did not* study the major of their choice in college, most said that they would have preferred to study medicine.[9] These patterns are worth closer examination. Perhaps these study participants all had a personal affinity for their medical field. Or perhaps their preference for this major reflects the hierarchical subtext that the Ministry of Education has established - medical students are the best of the best.

Considering what has emerged in extant literature and in this study, there needs to be a change in the system of academic tracking post-high school. Instead of associating higher NHEEE exams scores to certain disciplines, students who score relatively high on the exam should be admitted to the institutions *of their choice*. In making this change, the Ministry of Education would be rewarding students' high achievement on the exam with greater college choice, instead of rewarding achievement with access to certain disciplines. Additionally, allowing for greater choice in the selection of college major will help other future students be more successful in higher education once they are enrolled. As the quantitative data in this study shows, the perceived alignment between the discipline a student wanted to study and the discipline she was assigned proved to be a statistically significant predictor of undergraduate GPA (see regression model in Table 13). This statistic reinforces how the current academic tracking system can harm

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[9] One survey item asked "As a university student, was your assigned discipline of your first choice?" Most survey respondents (68.8%) said "yes," while 31.3% responded "no." For those who selected "no," a follow up question prompted them to state what discipline they originally wanted to study. A total of 30 people answered the follow up prompt, and among those, the majority (10 out of 30) said they would have rather studied medicine.

students' performance in college when it forces students to study a discipline they are not necessarily interested in.

Moreover, education leaders should discontinue the practice of assigning academic tracks based on the results of the General Secondary Education Certification Examination. Developmentally, the decision-making processes of someone at the end of 10th grade is vastly different from someone who is graduating from a university in their early adulthood (Mortimer, Zimmer-Gembeck, Holmes, & Shanahan, 2002). The current tracking system forces students into an academic trajectory that they must commit to at the age of 16. It is unrealistic to think that these adolescent students will not change their minds in the coming years, and it is unfair to trap them into career trajectory that they may not fully understand or desire. And while these changes to academic tracking may not exclusively benefit women, they are an important step in ensuring that women—like those represented in this study—can pursue specific disciplines and higher education institutions with more choice.

Reframing Affirmative Action Policy for Women. The language and scope of existing affirmative action policy for women should be redesigned to reflect systemic opportunity issues, rather than individual ability. Established in 1995, the current affirmative action for women in higher education higher education is written into the federal constitution (FDRE, 2015) and stipulates the following:

- Each female applicant is awarded an additional 15 average score points on the 12th grade examination.

- 30% of admitted seats in each university's cohort are reserved for women

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- Female applicants for faculty positions are awarded a nebulous, "5% advantage" in the evaluation mechanisms.

While these stipulations are a promising start for addressing barriers for women in the academy, they are not enough to accomplish the true work of redress that affirmative action is supposed to achieve. These policies are inadequate because they are based on a reductionist view of what it means to be a woman pursuing higher education. Furthermore, this simplistic view of women sets up the stage for campus cultures and student affairs programing that victimizes and infantilizes women, as seen in the findings chapter of this study.

To rectify this reductionist view of women, the language of affirmative action policies must be modified. Oftentimes, the rhetoric of policy documents and official reports connotes that women are recipients of benevolence and preferential treatment from higher education institutions. For example, on the official website of the Ministry of Education, there is a page dedicated to admissions criteria for university-level studies. On this page, under the subheading "Other Admission Requirements," there is a line that reads "Special privileges for female students and students from disadvantaged/remote regions" (2018). The term "special privileges" erroneously implies that the students who benefit from affirmative action are receiving a generous, underserved gift. In reality, this affirmative policy attempts (but largely fails) to undo centuries of gender-based, institutionalized discrimination. Instead of using the term "special privileges," the Ministry of Education should state how it recognizes the need for recruiting and supporting a diverse student body. A potential re-write of this particular section of the

Ministry's website could say: "The Ministry of Education is committed to diversity and inclusion for all universities. To redress discrimination, each student's gender, geographic location, and schooling background will be taken into consideration during the admissions process." In implementing this small, rhetorical shift, education leaders can turn scrutiny away from individual students, and instead focus on the structures of privilege and oppression that have created the conditions for inequality. This cultural and historical specificity (Mohanty, 1988) also helps institutions view women's reality beyond subordination, and moves into strategies for combating oppression.

In addition to a change in rhetoric, affirmative action policies should also allow for self-identification on the NHEEE. Study participants like Abigail (Interview 2) and Sewit (Interview 1) bristled at the thought of receiving an "unfair advantage" during the college admission process because they did not see themselves as less qualified than their male counterparts. Students like Abigail and Sewit, who do not want to be beneficiaries of this policy, should not be forced into it. Each student's autonomy should be respected during the university admissions process. In the future, the Ministry of Education should include an option for "Prefer Not to Disclose" in the demographic data section of all official application materials (like the 10th grade exam, 12th grade exam, and any formal written correspondence).

The affirmative action policy should also implement a more holistic, intersectional (Crenshaw, 1991) mechanism for assessing disadvantage among minority groups. As evidenced by various Chi square analyses in the findings chapter (complete list of analyses available in Appendix S), women's backgrounds and experiences are not

homogenous. There was a statistically significant difference in secondary education and higher education experiences between women of different demographic categories, as defined by parents' education level (see Chi-Square Test of Association #1, #2, and #3), siblings' education level (see Chi Square Test of Association #15), and level of English fluency (see Chi Square Test of Association #24). Similarly, the ArcGIS visualizations of undergraduate institutions and birthplace of institutions (available in Appendices P, Q, and R) suggest that persistence in higher education is associated with geographic proximity to an institution to higher education. While all this data did not predict higher education persistence, it did illuminate the need looking at each woman's socioeconomic background more holistically. Since each woman in this study existed at the intersection of systemically privileged and marginalized identities, it is ill-founded to subject all women to a uniform affirmative action policy. Instead, the Ministry of Education might consider using a tool like a "disadvantage index" for determining to what extent each female applicant should receive affirmative action consideration. In their study of the University of Colorado's class-based affirmative action policy, Gaertner and Hart (2013) create a disadvantage index that helps admissions committees assess each applicant's eligibility for affirmative action consideration. In this index, Gaertner and Hart (2013) quantify two categories of applicant traits: disadvantage and overachievement. To measure disadvantage, students socioeconomic background is compared with others in a "Disadvantage Index," based on a regression model of factors that influence enrollment in a four-year college or university, such as: parent's education level, family income, and English fluency. To measure overachievement, a student's high school grade point

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average (GPA), composite ACT scores, and composite SAT scores are compared to an "Overachievement Index," based on a regression model of factors (like student-to-teacher ratio in an applicant's high school) that influence academic achievement. Put together, these two measures place students within a matrix that would label them as "not disadvantaged," "moderately disadvantaged," or "severely disadvantaged." While this model would not directly translate into another national context, this index can serve as a template for a similar scoring mechanism for women in Ethiopia. In lieu of using composite ACT and SAT scores, for example, statisticians at the Ministry of Education could use NHEEE exam scores to calculate students' overachievement. Ultimately, this proposed solution is still flawed since oppression is subjective and cannot be entirely quantified. However, using a contextualized index mechanism—instead of automatically assigning women an arbitrary number of additional points on a standardized exam— would help higher education institutions move closer to gender equity.

When revising the affirmative action policy for women, education leaders should also complete a longitudinal assessment that examines the long-term impacts that this policy may have on women's educational attainment. Semela et al. (2017) point out that limited empirical research has been done on this topic. In the future, researchers from Ethiopia's National Educational Assessment and Examinations Agency should collaborate with individual public universities to see the academic trajectories of all women who have benefited from the 1995 federal affirmative action policy. The insight garnered from such an extensive study would also help policy makers understand how, if at all, this affirmative action policy has helped women stay in the science/technology

student to faculty pipeline. There were few study participants with advanced graduate

degrees in their disciplines that were on track to become faculty. Finding interviewees

like Melat—an advanced Ph.D. student who had a B.S. in Applied Biology, an M.S. in

Biomedical Science, and a guaranteed position at Wolkite University after graduation—

was rare. Furthermore, recent research shows that women continue to be

underrepresented in academic positions in higher education, even 20 years after the initial

affirmative action policy was implemented. For example, during the 2014-2015 year and

across all disciplines, women were 14.3% of graduate assistants, 8.8% of lecturers, and

5.3% of assistant/associate/full professors. In the same year, women across all academic

ranks made up only:

- 8.6% of faculty in engineering and technology

- 7.9% of faculty in natural and computational science

- 13.8% of faculty in medicine and health

- 13.8% of faculty in agricultural sciences (Semela et al., 2017)

These stark figures emphasize how much still needs to be accomplished in the

student to faculty pipeline. Thus, if longitudinal data was collected with regards to the

impact of the policy on women in science and technology specifically, the Ministry of

Education could use this information to reassess and improve female faculty recruitment

practices.

Pausing the Massification of Institutions. Finally, college-access practices can

be improved by pausing institutional massification and, instead, creating alternative

college pathways for women. When the current ruling political party, the Ethiopian

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People's Revolutionary Democratic Front (EPRDF), came into power in 1991, higher

education "…was identified as an instrument of poverty reduction and sustainable

development that demands the participation of all sections of society" (Tamrat, 2017). It

is understandable that EPRDF's zeal to eradicate poverty has motivated the frenzied

growth of higher education in the country. However, the impracticality of this growth

rate has been argued by numerous of scholars, including: Akalu (2014), (2015), (2016);

Molla (2013b), (2014b), (2018b); Teferra (2004), (2014), (2017); Tessema (2007),

(2009), and Semela (2006), (2011a), (2014). Considering the enormous expansion that

has already happened (many of 31 accredited public universities[10] have been established

in the past 30 years) it is time to stop establishing universities and turn attention to

fortifying the higher education institutions. This fortification can happen, in part, through

crafting alternative college pathways for minority students—namely, women.

To start, Ministry of Education leaders should create opportunities for retaking the

NHEE. Decades of international education research show that episodic, high-stakes

testing does not capture the true academic potential of students (Amrein & Berliner,

2002; Madaus, 1988; Polesel, Dulfer, & Turnbull, 2012; Wideen, O'Shea, Pye, & Ivany,

1997). Heeding this research, we can acknowledge that the NHEE is categorically flawed

as an instrument for predicting aptitude. Arguably, this exam acts as a barrier to higher

education access. To make matters worse, the logistics of how this test is administered

makes it even more difficult. Currently, university students have one chance to sit for the

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[10] Full list of accredited public universities, in alphabetical order, is available in
Appendix U

exam that will sort them into their target major. If students miss that opportunity for testing, then they forfeit their chance to pursue a certain discipline. Nardos, for example, experienced this mishap. During her first interview, she noted that:

> I studied at Addis Ababa University, the Science and Technology. I studied the field of chemical engineering. That's actually my second major. My first major I wanted to study was architecture. But eventually, I had – there was a confusion at the – on the examination day, so I wouldn't be able to make that day. So it passed me, so I directly went to my second major, the chemical engineering.

The limited testing windows for NHEE testing also prevents people from re-taking the exam for a higher score. To help mitigate these issues, the Ministry of Education should offer multiple dates (and versions) of the NHEE, as well as the option to re-take the exam for a higher score.

Furthermore, the Ministry of Education should design a pipeline program that helps students transfer from Technical and Vocational Education and Training (TVET) colleges to public universities. As previously noted, high school students enter the TVET programs based on their performance on the 10th grade national exam. Usually, students who start TVET coursework did not score high enough to be tracked into pre-university courses (Kelemu, 2013; Semela, 2011a). There are 458 TVET colleges in Ethiopia, both public and private, and they are designed for workforce development. Graduates of TVET programs are awarded diplomas (not degrees), and they are usually trained for technical and managerial careers (Ali, Firissa, & Legesse, 2017; Krishnan & Shaorshadze, 2013). While these education credentials are valid, there may be TVET

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graduates who are interested in getting a degree from a public university. Building a system where these students can transfer into a public university from a TVET program would be one way to increase access for women, without building yet another university. Previous research shows that women are more likely to attend a TVET college than a public university. Per Ministry of Education estimates, women comprised 51.9% of all TVET enrollment in 2015-2016 (Bekele et al., 2017). Thus, tapping into these institutions might serve the dual purpose of promoting the participation of women in public universities and increasing the number of science and technology professionals that contribute to economic development (provided that transfer students are assigned to study science and technology disciplines). When thinking about ways to achieve this recommendation, education leaders in Ethiopia should consider using the Transfer Admission Guarantee Programs, or TAG in California (Admissions, 2018) as an example. Based on a TAG agreement between community colleges (which are somewhat analogous to TVET programs) and participating campuses of the University of California system (which are somewhat analogous to public universities in Ethiopia), students can transfer into select UC schools after completing 30 semester units at a community college. While the comparison between the TAG system in the U.S. and a potential TVET-public university pipeline in Ethiopia is imprecise due to differences in funding and governance, the former could serve as a starting point for the latter.

In summary, the findings of this study support the case for changes in student affairs programming, teaching and learning, and college-access practices. While the units of analysis were female students/alumni of public universities, extant literature and best

practices from other institutions were integrated into these recommendations. In keeping with post-colonial feminist scholarship, women's experiences in a specific context were viewed as real, credible, and authoritative (Mohanty, 1988). In the long term, higher education institutions should make these changes so that the persistence of the women in this study are no longer rare occurrences at public universities. In doing so, higher education institutions can normalize discourse about power and equity in the academy, particularly in science and technology disciplines where myths about meritocracy are entrenched.

Chapter 6: Limitations and Possibilities of Women's Education as Liberation

With this final chapter, I conclude this study by showing how the current condition of women's persistence in higher education is a lens through which we can examine the possibilities and limitation of women's education as liberation. This is a timely assessment, considering the precarious position of the Ethiopian state as political and ethnic tensions have intensified (Kestler-D'Amours, 2018) and established systems of governance seemed to be on the brink of implosion up until very recently. The election of Dr. Abiy Ahmed—a member of the historically marginalized Oromo ethnic group and considered a charismatic political reformist by many—as the new prime minister of Ethiopia in April 2018 foreshadows increased stability in the nation (Mariam, 2018). Notwithstanding the widespread optimism that seems to have swept across Ethiopia with Prime Minister Ahmed's election (Abdu & Endeshaw, 2018), there is still much work to be done by the federal government to ensure that political and ethnic grievances are addressed.

Above all, I see how higher education in Ethiopia, as a system, is a discursive tool for colonialism. Strobel (1982) argues that colonialism was the cataclysmic and defining feature of African countries in the nineteenth and twentieth centuries. Colonialism, however, is more than an explicit mode of governance. While Ethiopia has never been legally colonized, its system of public administration is firmly positioned within a

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colonial matrix of power (Mignolo, 2007). Colonialism has functioned as an ideology and a system of power, which continues to privilege White, Western modes of being and thinking. In Ethiopian education, colonial epistemic violence has been pervasive because it often goes undetected, making it that much more entrenched. In accordance with this normalization, Spivak (1988) talks about the "…ferocious standardizing benevolence…" (p. 90) that U.S. and European models of thinking exert on communities in the Global South. Colonial modalities are taken for granted, they are assumed as normal.

The colonialism of education in Ethiopia is not new. A historical survey of how the formal education sector has emerged shows that a social hierarchy has been intentionally established. From its inception in modern Ethiopia, education has not been designed to liberate learners or serve minority populations. Pankhurst (1972), for instance, explains how education during the Italian occupation was used to advance the interests of the Italian empire. Italians created two categories of schools—one category for colonial subjects, and another category for the dominant race. Education for "natives" was focused on menial tasks and training, and schools were used by colonial officers to discipline and survey local people, especially in the region of Eritrea. In doing so, colonial representatives could more efficiently

> indoctrinate them with feelings of loyalty and subservience toward the fascist establishment, to give them an understanding of hygiene in part at least to reduce the dangers of contamination to Italians resident among them, and to prevent them from acquiring professional or political aspirations out of harmony with the fascist ethos (Pankhurst, 1972, p. 366).

Language policy, during the occupation, was also used to decentralize power. By replacing Amharic with Italian as the central language, colonial representatives helped

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destabilize indigenous, local education practices (Milkias & Kebede, 2010). Through these records, we see how colonial officers, in order to control the lower classes and native peoples, weaponized education. The vestiges of Italian colonial ideology can arguably be seen today, through practices like tracking lower-performing students into TVET colleges and the use of English language in high schools and universities.

The embedded colonialism of higher education is demonstrated by its commitment to the neoliberal marketization of knowledge. This is often excused because the goal of this neoliberal commitment is economic development. The results of this dissertation suggest that Ethiopian higher education is couched in a larger narrative about development, in the sense that much of education policy is designed to propel the country out of poverty. Economic development, however, is an elusive quest. Economic development agendas often reproduce Euro-American power structures, and have the implicit mission to civilize poor countries (Ndlovu-Gatsheni, 2012). Relatedly, McEwan (2001) contends that the

> texts of development are written in a representational language—metaphors, images, allusion, fantasy, and rhetoric—the imagined worlds bearing little resemblance of the real world. Development writing often produces and reproduces misrepresentation. (p. 96)

In this nebulous discourse, gender equity, specifically, is often used as a pretext for the notion of women's liberation as development. When considering development literature about women in this country, Fair (1996) shows how the U.S. media coverage of famine in Africa media during 1984-1985 often included images of Ethiopian and Somali women. There would often be photos of a woman with children, simultaneously depicted as the victim and the symbol of these countries. In these pictures and videos, their bodies

were tied to social ills. More broadly, the famine was implied to be a result of an unknowable, natural disaster, instead of a by-product of war and inequitable food distribution. Such news coverage is consistent with the androcentric ideas often documented in Western narratives about African countries, and echoes much of the subtext about women in development discourse. Fair goes on to argue that in much of European colonial travel fiction, Africa is often depicted as woman, specifically a woman with a fertile womb, ready to be exploited and controlled (1996). This identity did not come from the subjects themselves but was projected on them. Discursively, this depiction of the African woman has largely remained unchanged. In lieu of the starving woman in a drought, development literature often asks us to gaze at an overly fertile girl or woman who must have access to education to escape her plight. In each iteration of a colonial discourse, the African woman is seen primarily as a source of productive and reproductive labor. Women are rarely viewed as sentient, historical actors with agency and complexity. This reduction is easy to do because the "Other" is so far from Western understandings of what is human—in that the "Other" is Black, woman, and poor.

This same discourse, that reduces African women to instruments-for-development, is now echoed in the campaigns of the United Nation's Millennium Development Goals (Wilson, 2014), UN Sustainable Development Goals (Sachs, 2012), and the World Health Organization (Koffman & Gill, 2013), which often focus on gender and education. In these campaigns, girlhood and womanhood in the Global South are both used to justify intra/international interference from the West, particularly from the United States and the United Kingdom. Often, indigenous women in local communities

are subtly depicted as "…downtrodden victims of patriarchal values" (Koffman & Gill, 2013, p. 85). Conversely, an educated African woman is depicted as liberated, because she is free to engage in the local market economy. In this framing, consumerism, market engagement, and entrepreneurialism are conflated with liberation. The subtext here is that the traditional, cultural practices and norms of African women are backwards because they are anti-capitalist and cut women off from the liberating market. There appears to be an absolute trust in the idea that "…entrepreneurialism is the solution to global injustice, and presents a picture of neoliberal capitalism as a benign and benevolent force— *especially in the hands of women*" [emphasis in original] (Koffman & Gill, 2013, p. 91). There is a flaw in logic here. Educating women cannot solve the problem of poverty because the dearth of educated women did not cause structural poverty. Extractive, colonial practices cause structural poverty.

In conversations about structural poverty in Ethiopia and education, major lending agencies like the World Bank, the International Monetary Fund (IMF), the International Development Association (IDA), and the Department for International Development (DFID) are key actors. The World Bank is the single-most important external organization that shapes education policy-making in Ethiopia. This institution has introduced Structural Adjustment Programs and cost-sharing mechanisms, which are some of the most destructive initiatives for public education to date. In 2003, the Ethiopian government—facing strong pressure from the World Bank—ratified a cost-sharing policy that increased the use of private funds as a way of supporting the expansion of the higher education system. This policy, outlined in the Higher Education

Cost-Sharing Council of Ministers (Regulation No. 91/2003) and the Higher Education Proclamation (No. 650/2009; see Appendix B), requires that public university students pay for a portion of their tuition. Students have the option of either paying up front, or after graduation through government employment or a graduate tax (Molla & Gale, 2015; Saint, 2004). For historically marginalized students, such as women from low-income households, this additional financial burden makes the already arduous task of getting an education even more difficult. Meanwhile, the IMF advocates for reductions in government expenditure, increased privatization, and implementing user charges for traditionally public user goods, like education (IMF, 2015). In response to this, there has been a steady change in the fiduciary design and management of universities in the public sector. Public universities continue to look more and more like private ones. As this has occurred, the debt owed to external financial institutions like these has continued to grow. By the end of March 2016, Ethiopia owed 222 million USD and 5,002 million USD in external debt to the IMF and IDA, respectively (Atingi-Ego, Traa, & Panzer, 2016). The United Kingdom's DFID has supported projects like "Girl Effect" in Ethiopia, which attempts to improve the health outcomes and education access for girls and women in Ethiopia through market-centered media campaigns (Golant, 2015). A theme that seems to unify these various campaigns and initiatives is the enactment of "assistance" from hegemons in the Global North that aims to control the life of women in the Global South. It is also not lost on us that these campaigns come from hegemons in the Global North that aim to control the life of women in the Global South. In this regard, development discourse—particularly the kind that makes the educated girl child/woman the heroine of

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development narratives—is dangerous because it fails to interrogate the conditions that made her life precarious in the first place. In other words, if poverty is framed as a result of poor Black women not being educated (and not because of the predatory practices of multilateral lending agencies and the colonial conquests of hegemonic nation states), then colonial stratification can continue, unchecked. There is seldom conversation about redistribution of resources, or structural justice (Switzer, 2013). Rather, "…neoliberalism is portrayed as the liberating force through which patriarchy can be defeated" (Koffman & Gill, 2013, p. 90). Considering such historical evidence about the emergence of higher education in Ethiopia, we see the impact of class stratification and the interference of international lending agencies. Knowing what we do, we would be remiss to place the burden of doing hundreds of years of extractive, colonial practice on "…female exceptionalism as the singular 'solution' to global poverty" (Switzer, 2013, p. 347). It is time to engage with what Tikly (2001) calls a redefinition of the "core-periphery relationship" (p. 154).

 While such analysis is grim, this is not a call for abandoning education reform and transformation in Ethiopia. Rather, it is simply a call to complicate the motivations we have for implementing gender initiatives and the expectations we have for them. On the one hand, we must recognize the inherent limitations of education as liberation for women. The historical crimes of Italian colonizers and the predatory practices of the World Bank cannot be resolved by an affirmative action policy that makes the minimum NHEE score a bit lower for women. In fact, higher education institutions may perpetuate the patriarchy they purport to fight through their neoliberal policies and practices. On the

other hand, we should grapple with the good that public education accomplishes in Ethiopia. Women often join the informal job market, when formal is not available. In this regard, women are often responsible for labor that is never compensated (Kedir & Admasachew, 2010; Megento, 2013). Attaining a baccalaureate degree, particularly in the science and technology disciplines, might be a way that they are compensated for their contributions at the household and national level. While the education system is certainly troubling, accessing higher education, and thereby greater access to the market, may provide women with more choice and agency.

Finally, Ethiopian education leaders must do away with what strips students of their dignity, and demonstrate respect for indigenous, women-honoring ways of knowing and being. Postcolonial feminist analysis allows us to see the "Woman" as a discursive object of her own (Koffman & Gill, 2013), in that she becomes the main subject of our theorizing, rather than a victim of larger systems at play. Arguably, postcolonial feminism allows us to move the Ethiopian woman from margin to center (hooks, 1984). We must grapple with what feminist liberation might look like within the confines of an oppressive, neoliberalism-crazed, and endogenously anti-woman institution like higher education. In doing so, we will shift the critical gaze away from the women who have suffered most, and instead reposition our critique on the systems which have caused their suffering. Education leaders and policy makers must also recognize that they will likely never achieve gender equity in higher education or make these spaces perfectly inclusive for women. However, they can move toward that goal, and always strive for liberation by constantly investigating if university policies, practices, and campus environments are

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further oppressing or helping women reap the benefits of higher education. Without this critical investigation and explicit commitment to postcolonial feminist liberation, we are in danger of reifying the colonial violence on which the entire enterprise of education was built.

Recommendations for Future Research

There is ample room for further, postcolonial feminist research about women in Ethiopian higher education. Modern higher education in Ethiopia is both a result of the government's neoliberal infatuation and serves as a propagator of neoliberal practices— this is especially demonstrated by the massification of institutions. Women's participation in higher education, then, is often plotted is along the same trajectory. To critically engage with this trend, there should be further studies from scholars in the fields of both education and economics, that examine how and why women participate in the market economy because of their persistence in higher education.

Additionally, there should be further studies that attempt to tease out the impacts of rurality, quality of secondary education, family background, and religion on women's educational attainment. Further examining rurality is especially necessary. Notwithstanding rapid urbanization in recent years, most of Ethiopia's population (80%) resides in rural regions (Gardner, 2017a). Thus, higher education policy design must be situated within the context of rural life it is going to be effective and accessible for women in Ethiopia. Ideally, future studies should include randomized controlled trial designs, in which women who persist along certain indicators (ex. public vs. private high school attendance) can be examined. Additionally, it would be important to look at

college outcomes between women who have attended public universities, private universities, and TVET colleges. Important variables to consider between these groups, are:

- Graduation rates - especially if women graduate within 4-6 years of starting their programs.

- GPAs - both the cumulative GPA at the end of the undergraduate program, and how it changes from year to year.

- Perceived satisfaction with undergraduate experiences, including qualitative assessments of various student affairs services and faculty interactions.

Lastly, it would also be integral to compare the push-and-pull factors that motivate educated women to leave or stay in Ethiopia after graduating with different graduate and undergraduate degrees. As Gebrehiwot (2017) has demonstrated, the tendency of educated professionals to leave Ethiopia presents challenges for workforce development. Investigating how to retain educated women should be a policy priority for leaders.

Researcher Reflections

Methodologically, I tried to keep record of as much of my interactions with interviewees as I could to reach qualitative data saturation. I knew that I had reached qualitative data saturation when I noticed similarities in participant responses, and new ideas and themes emerged less frequently. After each meeting, I recorded memo notes about my initial perceptions of each interviewee, as well aspects of the interview setting that might have impacted our conversation. Conversations in hotel lobbies, for instance, seemed more relaxed and more honest than conversations I had at the AAU 4 Kilo

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campus because we were never at risk of being interrupted by university staff.

Meanwhile, the conversations at AAU 5 Kilo (which took place while the participants

and I were seated on a concrete ledge in a parking lot, where many students took their

lunch break), felt the most authentic to the student experience. The authenticity of these

conversations might be attributable to our presence on campus. The women I spoke to

could easily point out their classroom buildings or their friends as they answered the

questions from my interview protocol. I also maintained a researcher journal where I

recorded my perceptions of living in Ethiopia as a returnee and researcher with dual

positionality. I was struck by how generous people were with their time and stories. Most

participants fulfilled their commitment of meeting with me three times, even if that meant

traveling far distances to come to a place I recognized. My respondents were remarkably

kind, and a few of them even invited me to their homes for dinner or a movie. On Easter

Sunday, some respondents sent me text messages to wish me a happy holiday. The

kindness of my respondents is an aspect of the research process that I am incredibly

thankful for.

In this study, I operated from the premise that the marginalized identity of women

cannot be divorced from their experiences in education. Simultaneously, I sought to

produce academic scholarship that acknowledged women's achievements, while

presenting analyses that are consistent with Afrocentric cultural values and paradigms

(Ntseane, 2011). In many ways, writing this dissertation has been difficult because I

wanted to force participants to recognize their own oppression while still celebrating their

success. I strived to present an asset-based narrative about how Ethiopian women are

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competent, and do not have to leave their country to become qualified science and technology professionals. This was especially important to me as a member of the Ethiopian diaspora, who often witnessed public conversation about Ethiopia that flattened its diversity and presented it as a desolate, drought-ridden country of starving people.

During the research process, as I progressed in data collection, analysis, and writing, I found myself constantly reflecting back to the concept of colonization. For instance, when I learned that the gap between wealthy and poor countries continues to grow, and that development aid is a betrayal to the poor it is sent to (Negash, 2006), I saw these circumstances as a product of European colonization on poor African countries. Similarly, when study participants told me that their English language fluency has helped them persist in higher education, I saw their linguistic adaptation as a product of colonial practices in educational language policy. It also bothered me that the supremacy of English did not seem to bother them. I wanted my participants to join me in my rage against colonial epistemic violence, but they seemed relatively unencumbered by this anger. As I reflect on this, I realize that I failed to engage in what McEwan (2001) dubbed as "local feminist practice" (p. 106). In trying to superimpose my own frustrations on the women I interviewed and surveyed, I often centered the very oppression that I was trying so hard to resist. Colonialism is dizzying that way; it gives rise to itself and reinforces itself. To this present day, this is an area I have struggled with in research.

More pointedly, I gradually came to understand that I am an extension of the colonial enterprise. Many of the methodological and analytic decisions I made in this

process privileged my own comfort and ease as a researcher from the West, even at the expense of creating a more authentic narrative about the women I was studying. For example, as I wrote about the importance of indigenizing language practices in higher education, I was writing and carrying out my arguments in English. Likewise, after learning that Addis Ababa is the city in Ethiopia with the most private schools that cater to upper-class families, I continued to make this city the focus of my study, knowing that I would not be able to capture the voices of the most under-served. I chose not to engage in any conversations about the impact of ethnic identity on student persistence, despite knowing the recent political and social tensions surrounding ethnocentrism. For instance, I could have acknowledged the historic subjugation of the Oromo people, which make up 34% of the country's population, but have historically lacked representation in parliament. Inter-ethnic group tension has come to a recent boiling point in Ethiopian society and governance, contributing to many of the recent protests about federal land expansion into Oromia territory (Maasho, 2018; Tura, 2018). Knowing this, I could have used my dissertation study to highlight Oromo women's culture, the utility of the Oromiffa language in women's experiences in higher education, and Oromo women's epistemologies. However, I feared the controversial conversations that might have resulted among participants, and I was not willing to personally engage with complicated emotions. Recognizing these glaring contradictions between my philosophy and my actions, I often felt adrift, removed from participants' reality, and preoccupied with theory while I was living in Ethiopia. I recognize these shortcomings as contradictions, and I am compelled to address them in future work.

As I grapple with the colonization embedded into my own research practices and the education system I observed, my most important reflection on this research process is that I have done this research to find a sense of belonging. I have sought women who I thought were most like me in hopes of finding a sense of normalcy. My own experiences in college science classes were miserable and I wanted, desperately, to make those experiences not to go to waste by incorporating science education into my academic and professional journey. Much to my dismay, I have realized that my participants and I do not have a lot in common. Many of these women come from middle to upper class families that have presumably stayed in the upper echelons of Ethiopian society - they see the world very differently than I do. I was frustrated when they did not articulate a feminist ethos, or express meaningful concern for the success of other women in a way that was consistent with my own Western worldview. These were the very women I sought out to make me feel normal, and they turned out to be much more different from me than I could have ever imagined. I wanted to relate to the women who I was studying, but I felt further from them with nearly every interaction.

Moreover, being so far from my university, group of friends, and familiarity in the United States proved to be more isolating than I had anticipated. Oddly enough, one of the most rewarding interactions I had during this time was with a professor, not a student. The professor's name is Dr. Zewdinesh (pseudonym), and she was frequently mentioned in interviews when participants talked about female professors they have had. She, along with another individual from the gender office, had helped me recruit participants at the beginning of the study. I ran into her on campus one day during the spring semester, and

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she asked me about how my research was progressing. I told her that it was coming along, and that she was a huge reason that so many participants were willing to speak to me. I thanked her again for helping me in the recruitment process. In response to this, she told me in Amharic, "Of course we would help you. We would help anyone doing this kind of work, let alone one of us." In saying this small remark in passing, Dr. Zewdinesh unwittingly told me one of the most meaningful things I heard while I was in Ethiopia. She communicated to me that I belonged there, and that I was welcome amongst her and her colleagues. Through this conversation, I felt encouraged not only in my scholarly pursuit of completing a dissertation study, but also in my personal quest as an Ethiopian-American trying to find a place to belong. In a way, this conversation with her helped satisfy the underlying motivation for my work. While interviewees and survey respondents were not the ones I expected to find, they are the women that graciously welcomed me into their personal histories and community.

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Appendices

Appendix A – Ethiopian Education Pipeline
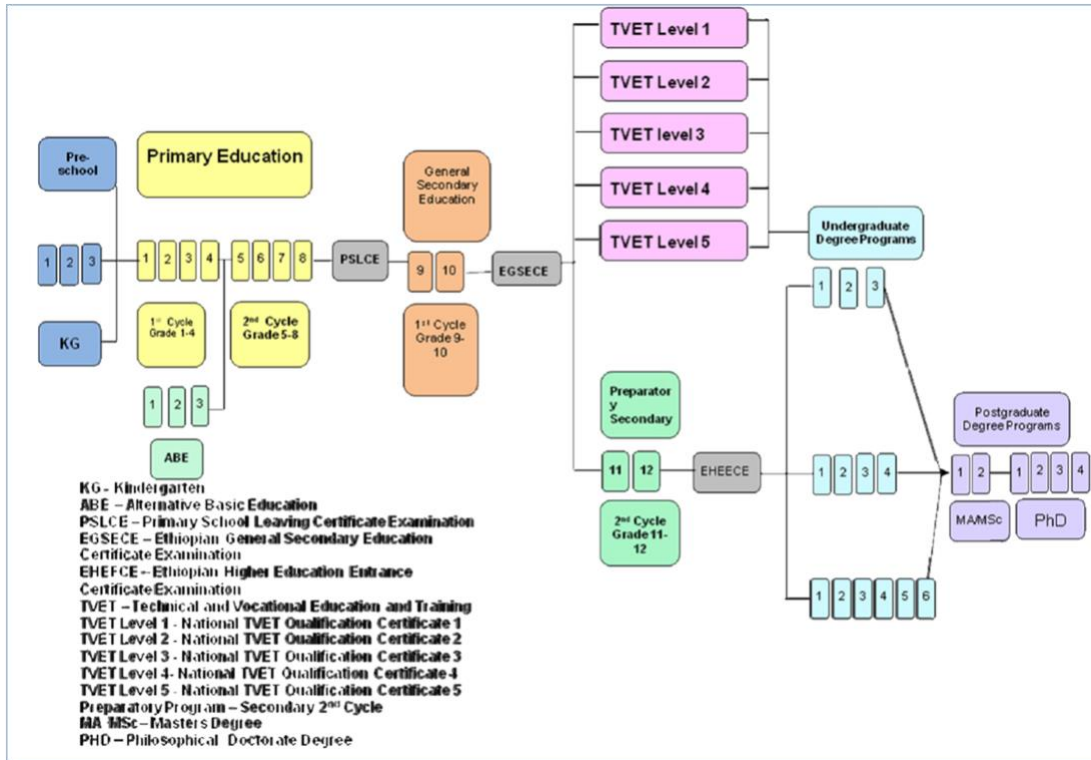
Overview of the Ethiopian education pipeline (Kelemu, 2013).

Appendix B – Summary of Educational Policies

Name	Designers and Year	Major Points
Education and Training Policy	Transitional Government of Ethiopia (1994)	Historically underrepresented students are granted affirmative action or "special attention" in university admission.
Education Sector Development Program Action Plan II	Ministry of Education (2002)	Cost-sharing scheme that requires use of private funds to support HEI expansion
Five-year Strategic Framework for Enhancing Women's Participation in Tertiary Education in Ethiopia	Ministry of Education (2004)	Affirmative action policy that lowers the minimum university entry scores for women and students from geo-politically "peripheral" ethnic groups
Higher Education Proclamation No. 650	Federal Democratic Republic of Ethiopia (2009)	Designed to increase access for students who have been excluded based on gender, disability, and ethnic origins. Commitment to establish public HEIs in geo-politically "peripheral regions" of the country.

Summary of Educational Policies affecting HEIs. (Molla & Gale, 2015).

Appendix C – Participant Invitation Email (Interview)

Dear [Insert Name of Department] Student,

My name is Meseret Hailu and I am a doctoral student in the Higher Education Department at the University of Denver. I am writing to invite you to participate in my research study about the experiences of women in undergraduate science and technology majors. You're eligible to be in this study because you are a female student studying science or technology at [Insert Name of Institution] University. I obtained your contact information from Dr. Tesfaye Semela, a professor of education at Hawassa University.

 If you decide to participate in this study, you will be interviewed by me three separate times. I would like to audio record your responses, and then we'll use that information to design a survey that I will then distribute to women at different universities in Ethiopia. None of your personal identity/information will be shared.

 Remember, this is completely voluntary. You can choose to be in this study or not. If you'd like to participate or have any questions about the study, please email or contact me at mfhailu@gmail.com

Thank you very much,

Sincerely,

Meseret Hailu
PhD Candidate

Appendix D – Participant Invitation Email (Anonymous Qualtrics Survey)

Dear Prospective Participant,

My name is Meseret Hailu. I am a doctoral student from the University of Denver. I am conducting an anonymous survey about the experiences of women in science and technology programs at Ethiopian universities. I am completing this research to learn about what helps women succeed in these majors. To participate, you must be 18 years or older. The survey is voluntary.

Since your answers are to remain anonymous, PLEASE DO NOT PUT YOUR NAME ON THIS SURVEY.

The survey will take approximately 20-30 minutes of your time. Please answer the questions to your comfort level.

The results will be reported for the group of respondents as a whole.

 If you choose to participate, please follow the link to the Qualtrics website and answer each question. Please click submit after the last question to ensure that your responses are recorded. The deadline to complete the survey is December 31, 2017.

 Thank you for your consideration.

 Sincerely,

Meseret Hailu
PhD Candidate
mfhailu@gmail.com

Appendix E – Interview Protocol 1

Introduction (Script): Thank you so much for taking time out of your busy schedule to meet with me and participate in my study. First, I will give you a copy of the consent form. I will give you a few minutes to read it and let me know if you have any questions

[provide participant 3-5 minutes to review form]

Are you finished reading? Great. Please sign the bottom of the page, indicating that you have read and understood this form, including the risks and benefits of participation. Are you comfortable with me recording the interview? Great. Please also sign the line which says you are.

As you know, this study is about the experiences of women in undergraduate science and technology programs.

Currently, women in science and technology are underrepresented within higher education at Ethiopian public universities—hindering economic development and stability. In my proposed study, I question what factors lead to the persistence of women in undergraduate science and technology majors at universities in Ethiopia. Hopefully, findings from this study will help universities and policy makers develop policies and programs that will support other female students in higher education.

Do you have any questions? Great, we will start with questions now.

Interview Questions (Script):

Demographic Questions
    What is your major?
    Why do you like your major?
    What year are you in your program?
    How long is your degree program?
    Could you please tell me about your home town or village?
    Which languages do you speak?
    Could you please tell me more about your religious background?
    How old are you?
    Do you have siblings? If so, are an older or younger sibling?
    How long have you lived in this city? Does it feel different from where you grew up?

Pre-University Entry Background
    Did you attend the school you were hoping to be assigned to while in preparatory school?
    How well did your preparatory education prepare you for university?

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How was the teaching and learning like in preparatory school? How were the facilities? Resources? In natural science classes, specifically?

How does your family feel about you being in university? Do you feel supported? Why or why not?

Can you describe the education level of your parents? Or your siblings, if any?

How would you describe your family's financial support of your education?

Has your level of English language proficiency affected your learning and performance in high school? How confident were you in your English language proficiency to succeed in university?

Can you describe, generally, your teachers from your primary education? Your secondary education? Were any of them women?

How did you perform on the Ethiopian General Secondary Education Certification Examination? What was that test like?

How did you perform on the Ethiopian University Entrance Examination? What was that test like?

Conclusion of First Interview (Script): Thank you, that is the end of my questions for today. The next time we meet, I will be asking you more questions about the past few years at this university. I want to know about your opinions, stories, and general reflections. When is a good time to meet for the second interview?

[Schedule interview time].

Thank you so much for your time, I know it is very valuable. Generally, how did today go for you? Do you have any suggestions for next time?

[Turn off recording device].

Appendix F – Interview Protocol 2

Introduction (Script): It's nice to see you again! Today, my questions will focus on your opinions, stories, and general reflections about the past few years at this university.

Interview Questions (Script):

Transition to University Life

What was your experience like when you started university? What surprised you?
Did you participate in new student orientation? If so, what was that like?
Do you live on campus in a residence hall/in a dormitory? Could you describe that for me?
Have financial constraints affected your experience?
Do you work on campus? If so, what is your position?
Can you describe your group of friends? Are they predominantly female? Male?
How did friendship with them affect your sense of belonging on campus?
What language do you speak with your friends when you are in your campus?
What language do you speak in class? What language do you speak with your family? If any of these are different, do you find that problematic?

Teaching and Learning Experiences

How would you describe the academic environment of this university?
What has been the best class you've taken? What about the most challenging?
Do you have classes with a lot of other female students? If so, could you describe your interaction with them?
How do finances impact your teaching and learning? Are your financially responsible for any of your supplies?
Do you have any female professors/instructors? Female staff members that you interact with? If so, how does that influence your learning?
Generally, what kind of teaching (pedagogy) do you prefer in lecture classes? In laboratories?
How do you study? How do you generally perform on exams? What helps you perform the best on exams?
Do you have to complete a lot of laboratory exercises? What are those experiences like?
Have you had the opportunity for research experiences outside of the university? If so, where?
What kind of academic experiences do you have during the summer?
How do the availability of resources/facilities at this university influence your performance?
How do you stay motivated toward learning your discipline?

Conclusion of Second Interview (Script):

Thank you, that is the end of my questions for today. The next time we meet, I will be asking you more questions about your preparation for life after university. I want to know about your opinions, stories, and general reflections. When is a good time to meet for the third interview?

[Schedule interview time].

Thank you so much for your time, I know it is very valuable. When you come next time, could you bring a drawing or journal article/artifact of your time in university that would serve as a symbol of your time in this program? Anything that you think would serve as a representation of how you have felt while pursuing this degree.

Also, how did today go for you? Do you have any suggestions for next time?

[Turn off recording device].

Appendix G – Interview Protocol 3

Introduction (Script): It's nice to see you again! Today, my questions will focus on your opinions, stories, and general reflections about the past few years at this university.

Interview Questions (Script):

Ongoing Social and Academic Integration

> What has been the best part of your undergraduate experience?
> What has been the most difficult part of your undergraduate experience?
> Do you utilize the services from the campus gender office? Why or why not?
> Do you have female mentors within the university? What about outside of the university?
> What do you want to do after you graduate from university?
> Where would you like to live as a working professional? Would you like to live in this same city or go elsewhere? Would you ever want to live abroad?
> Do you personally know any women who are doing the type of work you would like to do?
> What are some of the steps you must take to ensure that you will be a successful professional? What does professionalism mean to you?
> What advice would you give to a younger female student that would help her succeed in university?
> Is there anything else you would like to share with me?

Conclusion of Third Interview (Script):
Thank you, that is the end of my questions for today. I appreciate you sticking with me throughout this process.

How did today go for you? Do you have any suggestions for me as a researcher? Additionally, would you be willing and available to review some of the transcripts [member checking] to ensure that the interviews captured what you wanted to say?

Thank you so much, have a nice day.

[Turn off recording device].

Appendix H – Consent Form for Addis Ababa University

University of Denver
Consent Form for Participation in Research

Title of Research Study: Understanding Why Women Stay - Examining Persistence Factors of Women Majoring in Science and Technology Programs in Public Ethiopian Universities Using A Mixed Methods Design

Researcher(s): Meseret Hailu, PhD Student, University of Denver

Study Site(s): Addis Ababa University

Purpose
You are being asked to participate in a research study. The purpose of this research is to understand what factors lead to the persistence (to graduation) of women majoring in undergraduate science and technology programs in Ethiopian public universities?

Procedures
If you participate in this research study, you will be invited to participate in three interviews about your experiences in higher education at Addis Ababa University. Each interview should take 30 minutes to one hour of your time.

Voluntary Participation
Participating in this research study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. You may choose not to answer any question, continue the interview, or change your responses for any reason without penalty or other benefits to which you are entitled.

Risks or Discomforts
Potential risks and/or discomforts of participation may include discomfort and or/loss of privacy.

Benefits
Possible benefits of participation include contributing to an important research area about supporting women in education.

Incentives to participate
There is no compensation, reimbursement, or incentive being offered for participating in this research project.

Confidentiality

To keep your information safe, the primary investigator will keep your information confidential. At no time, will identifiers be linked to other data. The data will be kept on a password-protected computer. The primary investigator will retain the data for approximately 2 years, and then the data will be destroyed. The data will not be made available to other researchers for other studies following the completion of this dissertation study and will not contain information that could identify you. Only the primary investigator and a professional transcriber will have access to the recordings of your interviews. Once the interviews are transcribed, then the recordings will be destroyed. The results from the research will be used in dissertation findings for the primary investigator. Your individual identity will be kept private when information is published and your name will be replaced with a pseudonym of your choice.

Questions

If you have any questions about this project or your participation, please feel free to ask questions now or contact **Meseret Hailu** at mfhailu@gmail.com **or 720-261-6024** at any time. You may contact Meseret's doctoral adviser, Dr. Frank Tuitt at frank.tuitt@du.edu or 303.871.2591 with any questions as well.

If you have any questions or concerns about your research participation or rights as a participant, you may contact the DU Human Research Protections Program by emailing IRBAdmin@du.edu or calling (303) 871-2121 to speak to someone other than the researchers.

Options for Participation

Please initial your choice for the options below:

___The researchers may audio/video record or photograph me during this study.

___The researchers may NOT audio/video record or photograph me during this study.

Please take all the time you need to read through this document and decide whether you would like to participate in this research study.

If you agree to participate in this research study, please sign below. You will be given a copy of this form for your records.

_____   _____

Participant Signature   **Date**

Appendix I – Consent Form for Bair Dar University

University of Denver
Consent Form for Participation in Research

Title of Research Study: Understanding Why Women Stay - Examining Persistence Factors of Women Majoring in Science and Technology Programs in Public Ethiopian Universities Using A Mixed Methods Design

Researcher(s): Meseret Hailu, PhD Student, University of Denver

Study Site(s): Bahir Dar University

Purpose
You are being asked to participate in a research study. The purpose of this research is to understand what factors lead to the persistence (to graduation) of women majoring in undergraduate science and technology programs in Ethiopian public universities?

Procedures
If you participate in this research study, you will be invited to participate in three interviews about your experiences in higher education at Bahir Dar University. Each interview should take 30 minutes to one hour of your time.

Voluntary Participation
Participating in this research study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. You may choose not to answer any question, continue the interview, or change your responses for any reason without penalty or other benefits to which you are entitled.

Risks or Discomforts
Potential risks and/or discomforts of participation may include discomfort and or/loss of privacy.

Benefits
Possible benefits of participation include contributing to an important research area about supporting women in education.

Incentives to participate
There is no compensation, reimbursement, or incentive being offered for participating in this research project.

Confidentiality

To keep your information safe, the primary investigator will keep your information confidential. At no time, will identifiers be linked to other data. The data will be kept on a password-protected computer. The primary investigator will retain the data for approximately 2 years, and then the data will be destroyed. The data will not be made available to other researchers for other studies following the completion of this dissertation study and will not contain information that could identify you. Only the primary investigator and a professional transcriber will have access to the recordings of your interviews. Once the interviews are transcribed, then the recordings will be destroyed. The results from the research will be used in dissertation findings for the primary investigator. Your individual identity will be kept private when information is published and your name will be replaced with a pseudonym of your choice.

Questions
If you have any questions about this project or your participation, please feel free to ask questions now or contact **Meseret Hailu** at mfhailu@gmail.com **or 720-261-6024** at any time. You may contact Meseret's doctoral adviser, Dr. Frank Tuitt at frank.tuitt@du.edu or 303.871.2591 with any questions as well.

If you have any questions or concerns about your research participation or rights as a participant, you may contact the DU Human Research Protections Program by emailing IRBAdmin@du.edu or calling (303) 871-2121 to speak to someone other than the researchers.

Options for Participation
Please initial your choice for the options below:
___The researchers may audio/video record or photograph me during this study.
___The researchers may NOT audio/video record or photograph me during this study.

Please take all the time you need to read through this document and decide whether you would like to participate in this research study.

If you agree to participate in this research study, please sign below. You will be given a copy of this form for your records.

_____   _____

Participant Signature   **Date**

Appendix J – Consent Form for Hawassa University

University of Denver
Consent Form for Participation in Research

Title of Research Study: Understanding Why Women Stay - Examining Persistence Factors of Women Majoring in Science and Technology Programs in Public Ethiopian Universities Using A Mixed Methods Design

Researcher(s): Meseret Hailu, PhD Student, University of Denver

Study Site(s): Hawassa University

Purpose
You are being asked to participate in a research study. The purpose of this research is to understand what factors lead to the persistence (to graduation) of women majoring in undergraduate science and technology programs in Ethiopian public universities?

Procedures
If you participate in this research study, you will be invited to participate in three interviews about your experiences in higher education at Hawassa University. Each interview should take 30 minutes to one hour of your time.

Voluntary Participation
Participating in this research study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. You may choose not to answer any question, continue the interview, or change your responses for any reason without penalty or other benefits to which you are entitled.

Risks or Discomforts
Potential risks and/or discomforts of participation may include discomfort and or/loss of privacy.

Benefits
Possible benefits of participation include contributing to an important research area about supporting women in education.

Incentives to participate
There is no compensation, reimbursement, or incentive being offered for participating in this research project.

Confidentiality

To keep your information safe, the primary investigator will keep your information confidential. At no time, will identifiers be linked to other data. The data will be kept on a password-protected computer. The primary investigator will retain the data for approximately 2 years, and then the data will be destroyed. The data will not be made available to other researchers for other studies following the completion of this dissertation study and will not contain information that could identify you. Only the primary investigator and a professional transcriber will have access to the recordings of your interviews. Once the interviews are transcribed, then the recordings will be destroyed. The results from the research will be used in dissertation findings for the primary investigator. Your individual identity will be kept private when information is published and your name will be replaced with a pseudonym of your choice.

Questions

If you have any questions about this project or your participation, please feel free to ask questions now or contact **Meseret Hailu** at mfhailu@gmail.com **or 720-261-6024** at any time. You may contact Meseret's doctoral adviser, Dr. Frank Tuitt at frank.tuitt@du.edu or 303.871.2591 with any questions as well.

If you have any questions or concerns about your research participation or rights as a participant, you may contact the DU Human Research Protections Program by emailing IRBAdmin@du.edu or calling (303) 871-2121 to speak to someone other than the researchers.

Options for Participation

Please initial your choice for the options below:

___The researchers may audio/video record or photograph me during this study.
___The researchers may NOT audio/video record or photograph me during this study.

Please take all the time you need to read through this document and decide whether you would like to participate in this research study.

If you agree to participate in this research study, please sign below. You will be given a copy of this form for your records.

_____   _____

Participant Signature   **Date**

Appendix K – Demographic Form for Research Participants

Participant Pseudonym: _____

Please fill in the blanks the most appropriate answer for the following questions. You may leave responses blank if you do not prefer to answer a question.

What is your name?

_____

(Your name will not be used in this research study. All research documents will include pseudonyms. I ask for your name for follow up purposes.)

What is your email address? _____

What is your age? _____

Where is your place of birth (City/Region):

_____

Please indicate your undergraduate
institution:_____

Please indicate your undergraduate major:

_____

Please indicate your undergraduate
GPA:_____

Appendix L – Transcriptionist Confidentiality Statement

ADA
ACCURATE, DEPENDABLE, AFFORDABLE

Your source for Accurate, Dependable, Affordable Transcription

609-702-0801   info@adatranscription.com

Confidentiality and Nondisclosure Agreement

ADA Transcription guarantees to maintain full confidentiality in regard to any and all records, audio, names, information and documents provided in regard to the study *Understanding Why Women Stay: Examining Persistence Factors of Women Majoring in Science and Technology Programs in Public Ethiopian Universities Using a Mixed Methods Design* and materials received under the direction of *Meseret Hailu*, and those under their direction. In addition, ADA Transcription, being the service provider, agrees to the following stipulations of confidentiality:
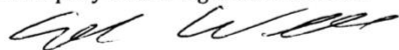
1) Any accidentally released identification by any individual during the transcription of interviews, focus groups, or any other recorded audio or released documentation, will be held in complete confidence.

2) All study-related materials, including, audio, transcripts, study information, documentation, and any other materials received by or created for the project, are safely and securely kept and maintained while under the possession of ADA Transcription.

3) If any physical materials, tapes, audio or transcripts are released they will be returned completely in a timely manner and/or on the agreed upon date.

4) No copies of any material, audio, or documents are ever duplicated, unless under specific direction by *Meseret Hailu,* and those under their direction.

5) All audio files and transcripts are completely deleted three weeks after payment is received. Any study-related information or documentation may be kept during the course of the entire study. All study-related information and documentation is then deleted within three weeks of completion (and final payment) of the study. This includes hard drives, back up hard drives, and any and all device copies that may exist.

6) Any and all identifying information, *outside of the file name*, will be removed from all transcripts, unless under specific direction of *Meseret Hailu,* and those under their direction. Transcripts can also be password protected before being sent to recipients

7) All audio uploaded to our website is encrypted and secure both during transfers AND when at rest.

ADA Transcription is aware that it holds the legal responsibility to maintain this confidentiality agreement, and can be held legally liable for any breach of this confidentiality agreement, along with any possible harm incurred by individuals if confidential or identifying information is released or disclosed at any time due to a breach of this contract.

Transcription Company Name:_____**ADA Transcription**_____

Transcription Company Owner Name:_____Erika Wassall_____

Transcription Company Owner Signature and Date: 3/30/17

Appendix M – Emergent Quantitative Survey

☐ Q1 Introduction

⚙ Dear Prospective Participant,

My name is Meseret Hailu. I am a PhD student from the University of Denver. I am conducting a study about the experiences of women in science and technology programs at Ethiopian universities. I am completing this research to learn about what helps women succeed in these majors. To participate, you must be:

- 18 years or older
- A woman who has studied science or technology
- A senior student/alumni of a public university in Ethiopia

The survey is voluntary. Since your answers are to remain anonymous, PLEASE DO NOT PUT YOUR NAME ON THIS SURVEY.

The survey will take approximately 15-20 minutes of your time. There are 24 questions. Please answer the questions to your comfort level.

The results will be reported for the group of respondents as a whole.

If you choose to participate, please follow the link to the Qualtrics website and answer each question. Please click submit after the last question to ensure that your responses are recorded. The deadline to complete the survey is December 31, 2017.

If you have any questions about this project or your participation, please feel free to ask questions now or contact Meseret Hailu at mfhailu@gmail.com or +251.984876682 at any time. You may contact Meseret's doctoral adviser, Dr. Frank Tuitt at frank.tuitt@du.edu or +1303.871.2591 with any questions as well.

If you have any questions or concerns about your research participation or rights as a participant, you may contact the DU Human Research Protections Program by emailing IRBAdmin@du.edu or calling +1303.871.2121 to speak to someone other than the researchers.

Thank you for your participation.

Sincerely,

Meseret Hailu
PhD Candidate
mfhailu@gmail.com

Q2 **Part 1: Family and Secondary Education Background**

Have either of your parents earned a university degree?

- ○ Yes
- ○ No

Q3 Do you have any brothers or sisters who have earned a university degree?

- ○ Yes
- ○ No

Q4 What kind of secondary school did you attend?

- ○ Private, single gender (all girls school)
- ○ Private, mixed gender
- ○ Public/government

Q5 What is your religion?

- ○ Orthodox Christian
- ○ Protestant Christian
- ○ Muslim
- ○ Other (please fill in)

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☐ Q6 How would you describe your family's economic class?

⚙

✱
○ Lower class (less than 2,250 ETB per month)

○ Middle class (between 2,250-6,129 ETB per month)

○ Upper class (more than 6,129 ETB per month)

☐ Q7 For the following statements about your family and secondary education, please select your level of agreement.

⚙

✱

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Growing up, my family members expected me to attend a university.	○	○	○	○	○
Growing up, my religion was important to me.	○	○	○	○	○
I have people in my family who I can talk to about science and technology careers.	○	○	○	○	○
The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	○	○	○	○	○
My secondary education sufficiently prepared me for university classes.	○	○	○	○	○
Having female teachers in secondary school was important to me.	○	○	○	○	○
Having female classmates in secondary school was important to me.	○	○	○	○	○

I was satisfied with my performance on the Ethiopian General Secondary Education Certification Examination (10th grade exam).	○	○	○	○	○
I was satisfied with my performance on the Ethiopian University Entrance Examination (12th grade exam).	○	○	○	○	○
Overall, I was confident about my academic ability when I finished secondary school.	○	○	○	○	○

▼ Part 2: Higher Education Experiences   Block Options

☐ Q8   **Part 2: Higher Education Experiences**

⚙   Would you consider yourself a fluent English language speaker?

✳   ○ Yes

         ○ No

☐ Q9   As a university student, was your assigned campus your first choice?

⚙   ○ Yes

✳   ○ No (Please include which campus you wanted to attend) [_____]

☐   As a university student, was your assigned discipline your first choice?
Q10
         ○ Yes
⚙
         ○ No (Please include what discipline you wanted to study) [____]
✳

☐ Q11   Did you take any additional courses (in a different field) at a private college/university (other than your assigned campus) as an undergraduate student?

⚙   ○ Yes (If so, what type of courses?) [_____]

✳   ○ No

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Q12 Did you participate in an internship while you were an undergraduate student?

- ○ Yes
- ○ No

Q13 For the following statements about your higher education experiences, please select your level of agreement.

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
My first year (freshman year) was difficult.	○	○	○	○	○
Freshman orientation was helpful.	○	○	○	○	○
Science/technology are more rigorous fields than the social sciences/law.	○	○	○	○	○
In university lecture courses, I cared more about understanding the material than I cared about getting high marks.	○	○	○	○	○
In university lecture courses, I enjoyed interactive activities.	○	○	○	○	○
In university lecture courses, I learned practical skills about my discipline.	○	○	○	○	○
I learned a lot of information from lab courses.	○	○	○	○	○
I wish I had more flexibility in course selection I took as an undergraduate student.	○	○	○	○	○
I used the services of the gender office.	○	○	○	○	○
Overall, I enjoyed my experience in university.	○	○	○	○	○

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Part 3: Career Goals and Life After University

Q14

⚙

✳

What did you pursue (or plan to pursue) after graduating with your B.S. degree?

○ Work

○ Master's degree

○ Both

○ Neither

Q15

⚙

✳

Did you stay (or plan to stay) in the same city as your undergraduate university?

○ Yes

○ No

Q16

⚙

✳

Are you in the same field as what you studied in university?

○ Yes

○ No

Q17

⚙

✳

Are you interested in graduate education outside of Ethiopia?

○ Yes

○ No

Q18   Are you interested in working professionally outside of Ethiopia?

○ Yes (please include where) [   ]

○ No

Q19   For the following statements about your career goals and life after university, please select your level of agreement.

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Long-term internships (1 year or longer) would have increased the quality of my undergraduate education.	○	○	○	○	○
When I look back at my undergraduate education, I wish I had studied something else.	○	○	○	○	○
My undergraduate education has been useful in my professional life.	○	○	○	○	○
There are many opportunities for recent university graduates in my field.	○	○	○	○	○
I want to interact with more women who are science and technology professionals.	○	○	○	○	○
Younger women reach out to me asking me for advice about science and technology.	○	○	○	○	○
I want to mentor younger women who are interested in science and technology.	○	○	○	○	○
People who study science/technology should also take business/entrepreneurship courses.	○	○	○	○	○
I consider myself an entrepreneur.	○	○	○	○	○
Overall, I enjoy my current career.	○	○	○	○	○

Part 4: Demographic Information (Optional)

Q20

What is your age?

☐

⚙

Q21

Where is your place of birth (City/Region)?

☐

⚙

Q22

Please state your undergraduate institution.

☐

⚙

Q23

Please state your undergraduate discipline.

☐

⚙

Q24

Please state your undergraduate GPA.

☐

⚙

Appendix N – Addis Insight Advertisements on LinkedIn/Facebook (Amharic & English)

Meseret Hailu is a PhD student at the University of Denver conducting research on women who have studied science and technology at a public university in Ethiopia.

If you are currently in your final year of study or a graduate of a public university in Ethiopia, please assist her by completing this survey:
http://bit.ly/2kkZYXz

#ad #ethiopia #science #technology #women #ethiopianstudents #ethiopianwomen #publicuniversity

👍 Like   💬 Comment   ↪ Share

📷   Write a comment...   GIF ☺

መሰረት ሃይሉ በዴንቨር ዩኒቨርስቲ የፒኤችዲ ተማሪ ስትሆን በኢትዮጵያ የመንግስት ዩኒቨርስቲ የምትማሩ ሴት የሳይንስ እና ቴክኖሎጂ ተመራቂ ተማሪዎች እባካችሁን እዚህ ፖስት ላይ ያለውን ሊንክ በመጫን ሰርቬይውን በመሙላት ተባበሩዋት። http://bit.ly/2kkZYXz

Meseret Hailu is a PhD student at the University of Denver conducting research on women who have studied science and technology at a public university in Ethiopia.

If you are curre... Continue Reading

👍 17

🙵 Like   💬 Comment   ↪ Share

🙵 Like   💬 Comment   ↪ Share

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Appendix O – Summary of Qualtrics Survey Responses By Date

Date	Responses
11 Dec 17	1 (0.47%)
12 Dec 17	3 (1.4%)
13 Dec 17	1 (0.47%)
14 Dec 17	16 (7.48%)
15 Dec 17	3 (1.4%)
16 Dec 17	1 (0.47%)
17 Dec 17	4 (1.87%)
18 Dec 17	5 (2.34%)
19 Dec 17	1 (0.47%)
20 Dec 17	2 (0.93%)
21 Dec 17	1 (0.47%)
22 Dec 17	22 (10.28%)
23 Dec 17	11 (5.14%)
24 Dec 17	4 (1.87%)
25 Dec 17	5 (2.34%)
26 Dec 17	4 (1.87%)
27 Dec 17	13 (6.07%)
28 Dec 17	20 (9.35%)
29 Dec 17	9 (4.21%)
30 Dec 17	3 (1.4%)
31 Dec 17	3 (1.4%)
01 Jan 18	3 (1.4%)
02 Jan 18	2 (0.93%)
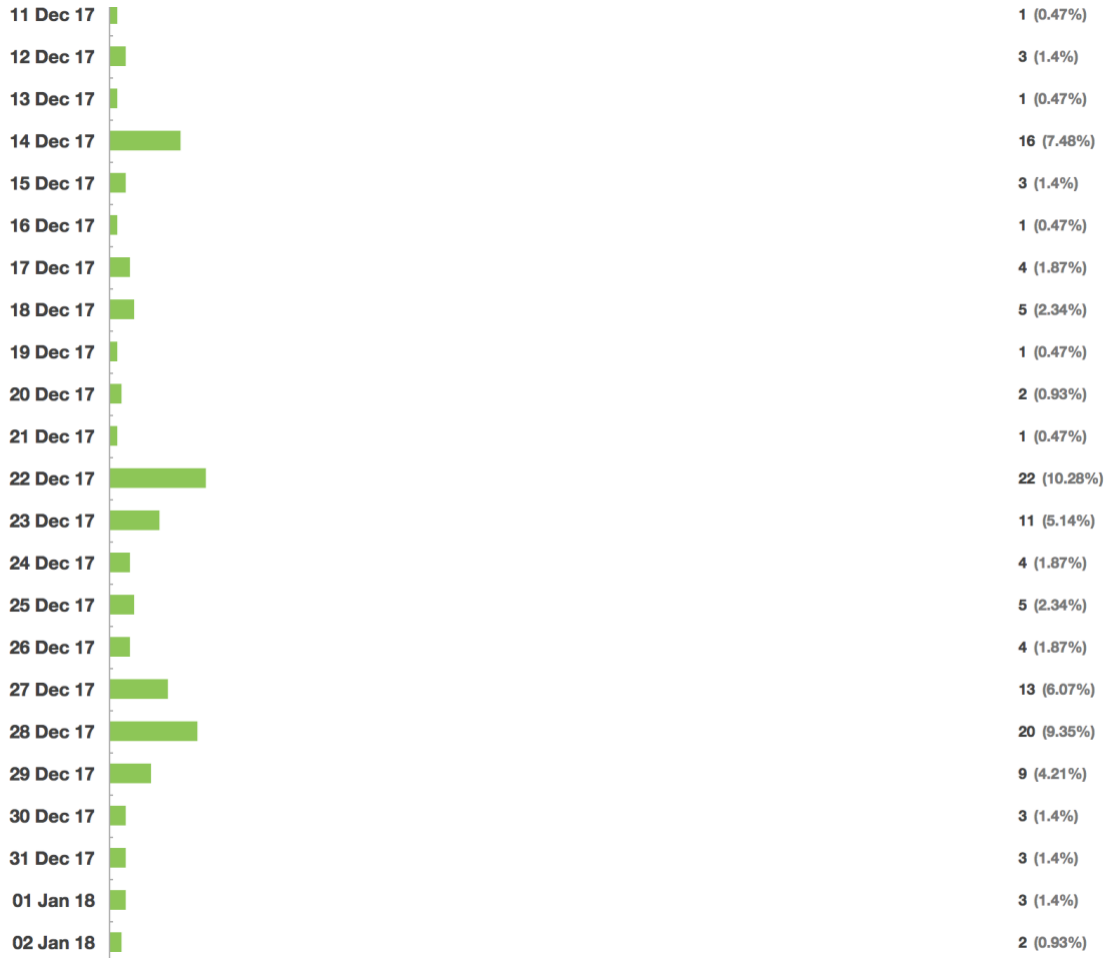
Appendix P – ArcGIS Visualization of Undergraduate Institutions

Interactive Map Available:
https://www.arcgis.com/apps/presentation/index.html?webmap=2324ebbe02764f579a2b6f9eccec1152
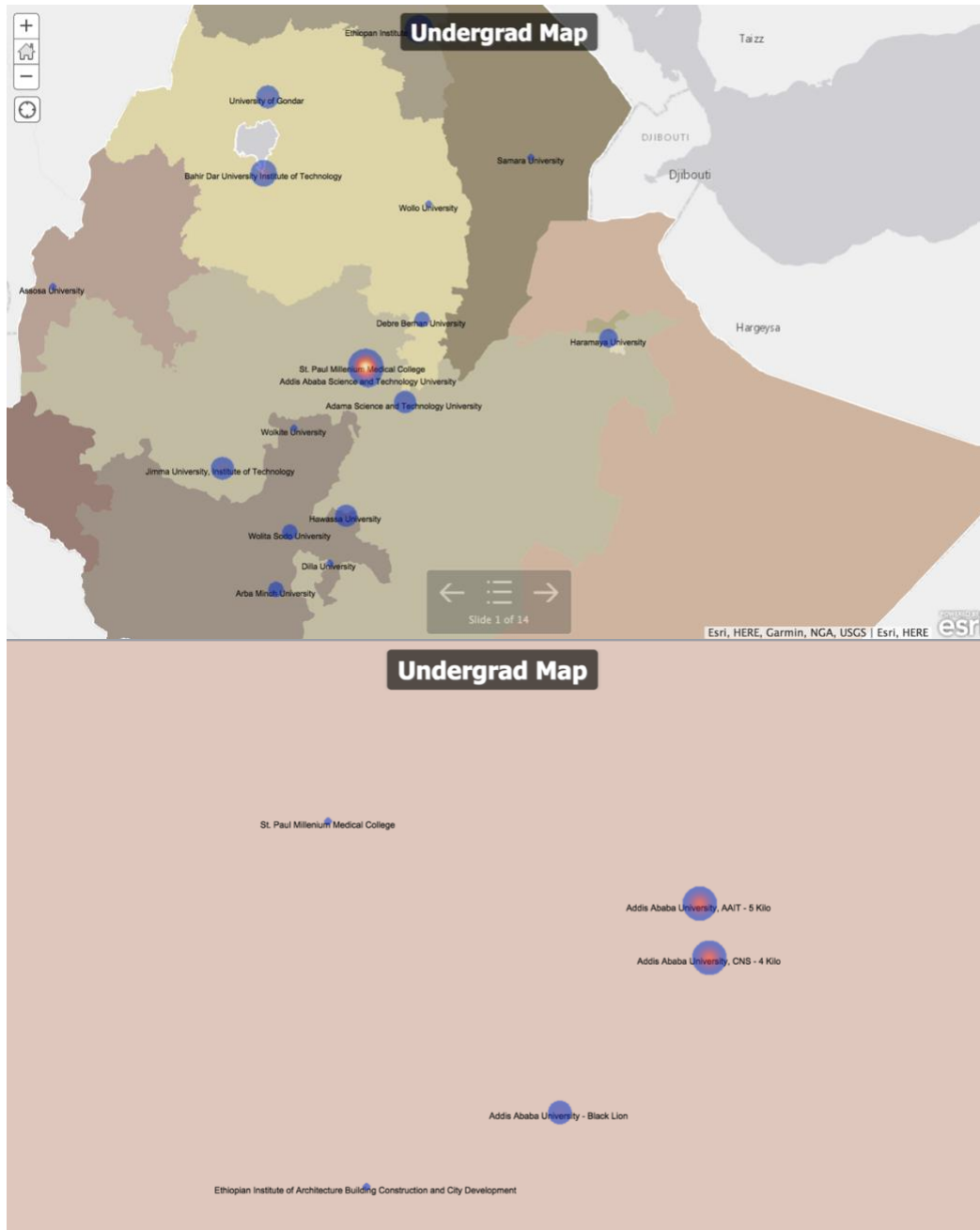
Appendix Q – ArcGIS Visualization of Birthplace of Survey Respondents

Birthplace of Participants

Interactive Map Available:
https://www.arcgis.com/apps/presentation/index.html?webmap=91d8ab28039b4a93a6cb1874a930c85f
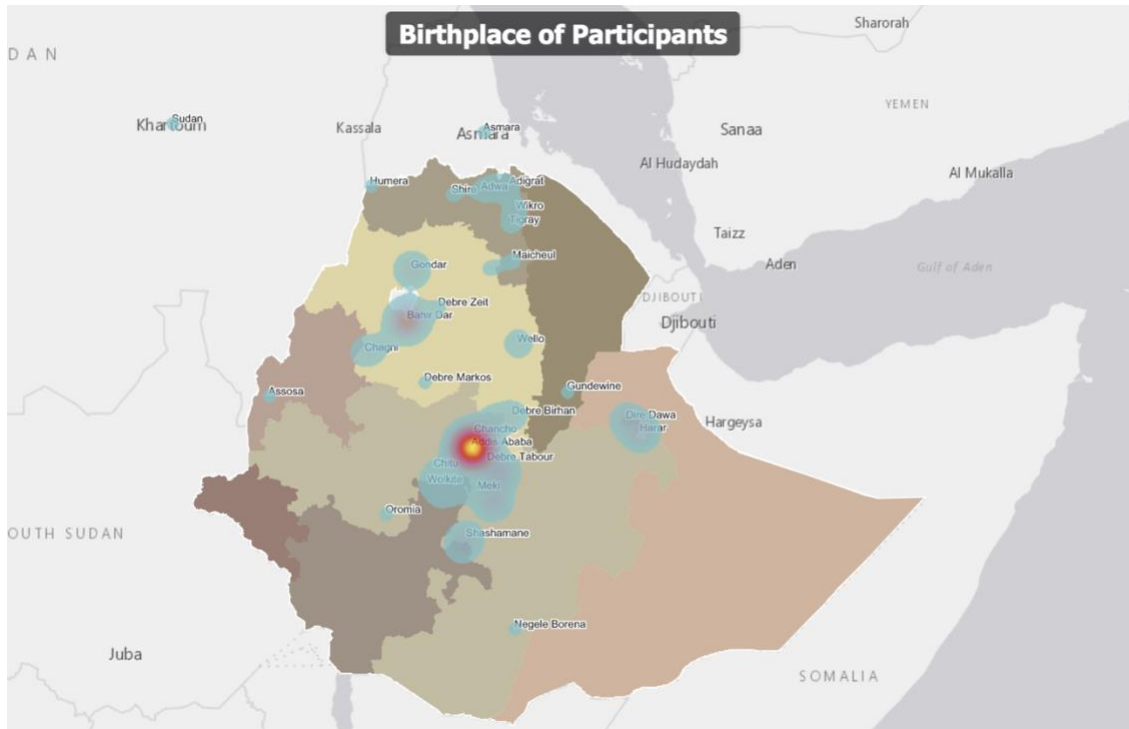
Appendix R – ArcGIS Visualization of Undergraduate Institution and Birthplace of

Survey Respondents (Overlaid)

Interactive Map Available:
https://www.arcgis.com/apps/presentation/index.html?webmap=91d8ab28039b4a93a6cb
1874a930c85f
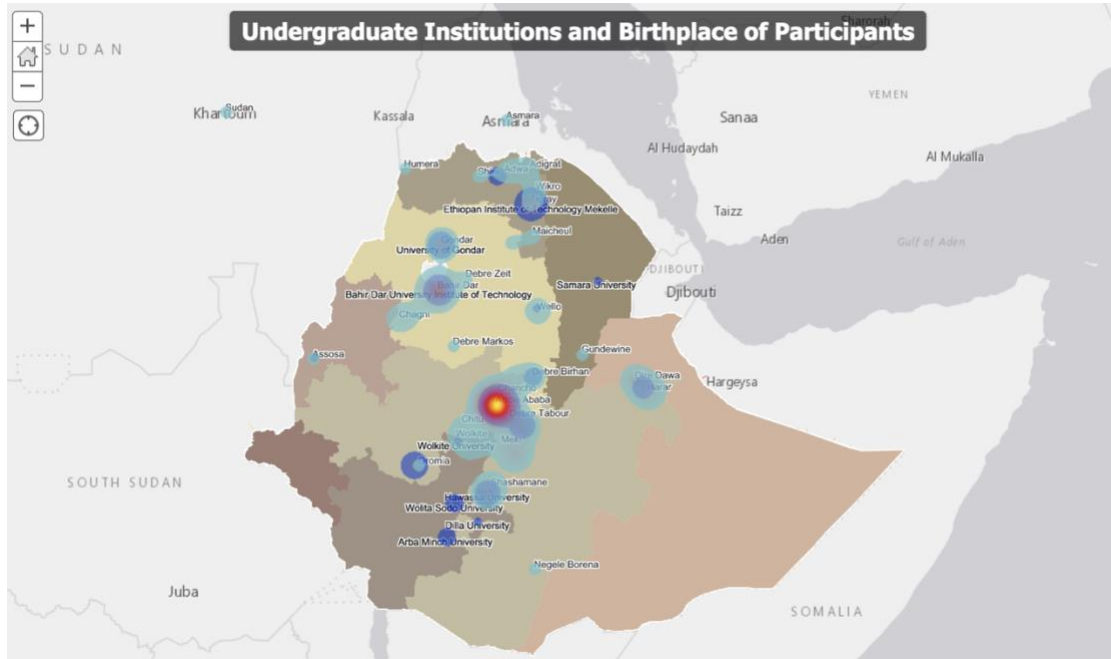
Appendix S – SPSS Outputs of Chi Square Analyses

Chi-Square Test of Association 1 and corresponding crosstab: **significant association**

Comparison of Variables:
- Have either of your parents earned a university degree? (categorical variable)
- I have people in my family who I can talk to about science and technology careers.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.797[a]	4	**.005**
Likelihood Ratio	15.227	4	.004
Linear-by-Linear Association	10.909	1	.001
N of Valid Cases	202		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.93.

			Crosstab					
			For the following statements about your family and secondary education, please select your level of agreement. - I have people in my family who I can talk to about science and technology careers.					Total
			Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	
Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	Yes	Count	5	7	5	47	36	100
		% within Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	5.0%	7.0%	5.0%	47.0%	36.0%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - I have people in my family who I can talk to about science and technology careers.	35.7%	25.9%	27.8%	56.6%	60.0%	49.5%
		% of Total	2.5%	3.5%	2.5%	23.3%	17.8%	49.5%
	No	Count	9	20	13	36	24	102
		% within Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	8.8%	19.6%	12.7%	35.3%	23.5%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - I have people in my family who I can talk to about science and technology careers.	64.3%	74.1%	72.2%	43.4%	40.0%	50.5%
		% of Total	4.5%	9.9%	6.4%	17.8%	11.9%	50.5%
Total		Count	14	27	18	83	60	202
		% within Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	6.9%	13.4%	8.9%	41.1%	29.7%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - I have people in my family who I can talk to about science and technology careers.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	6.9%	13.4%	8.9%	41.1%	29.7%	100.0%

<u>Chi-Square Test of Association 2 and corresponding crosstab:</u> **significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.364[a]	4	**.023**
Likelihood Ratio	11.689	4	.020
Linear-by-Linear Association	9.820	1	.002
N of Valid Cases	202		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.87.

Crosstab

| | | | For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate. | | | | | Total |
			Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	
Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	Yes	Count	9	23	14	34	20	100
		% within Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	9.0%	23.0%	14.0%	34.0%	20.0%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	26.5%	45.1%	53.8%	58.6%	60.6%	49.5%
		% of Total	4.5%	11.4%	6.9%	16.8%	9.9%	49.5%
	No	Count	25	28	12	24	13	102
		% within Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	24.5%	27.5%	11.8%	23.5%	12.7%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	73.5%	54.9%	46.2%	41.4%	39.4%	50.5%
		% of Total	12.4%	13.9%	5.9%	11.9%	6.4%	50.5%
Total		Count	34	51	26	58	33	202
		% within Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	16.8%	25.2%	12.9%	28.7%	16.3%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	16.8%	25.2%	12.9%	28.7%	16.3%	100.0%

Chi-Square Test of Association 3 and corresponding crosstab: **significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- My secondary education sufficiently prepared me for university classes.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	15.252[a]	4	**.004**
Likelihood Ratio	15.800	4	.003
Linear-by-Linear Association	14.117	1	.000
N of Valid Cases	203		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.97.

Crosstab

			For the following statements about your family and secondary education, please select your level of agreement. - My secondary education sufficiently prepared me for university classes.					Total
			Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	
Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	Yes	Count	4	8	18	51	20	101
		% within Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	4.0%	7.9%	17.8%	50.5%	19.8%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - My secondary education sufficiently prepared me for university classes.	28.6%	24.2%	51.4%	57.3%	62.5%	49.8%
		% of Total	2.0%	3.9%	8.9%	25.1%	9.9%	49.8%
	No	Count	10	25	17	38	12	102
		% within Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	9.8%	24.5%	16.7%	37.3%	11.8%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - My secondary education sufficiently prepared me for university classes.	71.4%	75.8%	48.6%	42.7%	37.5%	50.2%
		% of Total	4.9%	12.3%	8.4%	18.7%	5.9%	50.2%
Total		Count	14	33	35	89	32	203
		% within Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	6.9%	16.3%	17.2%	43.8%	15.8%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - My secondary education sufficiently prepared me for university classes.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	6.9%	16.3%	17.2%	43.8%	15.8%	100.0%

<u>Chi-Square Test of Association 4</u>: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- I was satisfied with my performance on the Ethiopian General Secondary Education Certification Examination (10th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.062[a]	4	**.548**
Likelihood Ratio	3.081	4	.544
Linear-by-Linear Association	1.232	1	.267
N of Valid Cases	202		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.42.

Chi-Square Test of Association 5: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- I was satisfied with my performance on the Ethiopian University Entrance Examination (12th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.482[a]	4	**.648**
Likelihood Ratio	2.490	4	.646
Linear-by-Linear Association	1.606	1	.205
N of Valid Cases	203		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.46.

Chi-Square Test of Association 6: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- My first year (freshman year) was difficult.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.479[a]	4	**.242**
Likelihood Ratio	5.529	4	.237
Linear-by-Linear Association	1.105	1	.293
N of Valid Cases	178		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.16.

Chi-Square Test of Association 7: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- Freshman orientation was helpful.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.160[a]	4	**.531**
Likelihood Ratio	3.196	4	.526
Linear-by-Linear Association	.473	1	.492
N of Valid Cases	178		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.25.

Chi-Square Test of Association 8: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- In university lecture courses, I cared more about understanding the material than I cared about getting high marks.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.669[a]	4	**.796**
Likelihood Ratio	1.678	4	.795
Linear-by-Linear Association	.004	1	.952
N of Valid Cases	178		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.64.

Chi-Square Test of Association 9: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- In university lecture courses, I learned practical skills about my discipline.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.975[a]	4	**.290**
Likelihood Ratio	5.065	4	.281
Linear-by-Linear Association	1.047	1	.306
N of Valid Cases	178		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.07.

Chi-Square Test of Association 10: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- I learned a lot of information from lab courses.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.957[a]	4	**.916**
Likelihood Ratio	.961	4	.916
Linear-by-Linear Association	.536	1	.464
N of Valid Cases	178		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.12.

Chi-Square Test of Association 11: **not a significant association**

Comparison of Variables

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- Have either of your parents earned a university degree? (categorical variable)
- I used the services of the gender office.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.383[a]	4	**.357**
Likelihood Ratio	4.450	4	.349
Linear-by-Linear Association	.015	1	.902
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.55.

Chi-Square Test of Association 12: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable
- When I look back at my undergraduate education, I wish I had studied something else.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.700[a]	4	**.069**
Likelihood Ratio	8.908	4	.063
Linear-by-Linear Association	.838	1	.360
N of Valid Cases	163		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.44.

Chi-Square Test of Association 13: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- There are many opportunities for recent university graduates in my field.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.529ª	4	**.163**
Likelihood Ratio	6.596	4	.159
Linear-by-Linear Association	.577	1	.447
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.86.

Chi-Square Test of Association 14: **not a significant association**

Comparison of Variables
- Have either of your parents earned a university degree? (categorical variable)
- I consider myself an entrepreneur.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.164ª	4	**.884**
Likelihood Ratio	1.168	4	.883
Linear-by-Linear Association	.318	1	.573
N of Valid Cases	163		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.45.

Chi-Square Test of Association 15: **significant association**

Comparison of Variables
- Do you have any brothers or sisters who have earned a university degree? (categorical variable)
- The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.094[a]	4	**.011**
Likelihood Ratio	13.134	4	.011
Linear-by-Linear Association	2.508	1	.113
N of Valid Cases	202		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.85.

Crosstab

			For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.					Total
			Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	
Do you have any brothers or sisters who have earned a university degree?	Yes	Count	18	40	14	41	28	141
		% within Do you have any brothers or sisters who have earned a university degree?	12.8%	28.4%	9.9%	29.1%	19.9%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	52.9%	78.4%	53.8%	70.7%	84.8%	69.8%
		% of Total	8.9%	19.8%	6.9%	20.3%	13.9%	69.8%
	No	Count	16	11	12	17	5	61
		% within Do you have any brothers or sisters who have earned a university degree?	26.2%	18.0%	19.7%	27.9%	8.2%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	47.1%	21.6%	46.2%	29.3%	15.2%	30.2%
		% of Total	7.9%	5.4%	5.9%	8.4%	2.5%	30.2%
Total		Count	34	51	26	58	33	202
		% within Do you have any brothers or sisters who have earned a university degree?	16.8%	25.2%	12.9%	28.7%	16.3%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	16.8%	25.2%	12.9%	28.7%	16.3%	100.0%

Chi-Square Test of Association 16: **not a significant association**

Comparison of Variables
- Do you have any brothers or sisters who have earned a university degree? (categorical variable)
- I was satisfied with my performance on the Ethiopian General Secondary Education Certification Examination (10th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.147[a]	4	**.533**
Likelihood Ratio	3.132	4	.536
Linear-by-Linear Association	1.423	1	.233
N of Valid Cases	202		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.05.

Chi-Square Test of Association 17: **not a significant association**

Comparison of Variables
- Do you have any brothers or sisters who have earned a university degree? (categorical variable)
- In university lecture courses, I cared more about understanding the material than I cared about getting high marks.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.078[a]	4	**.898**
Likelihood Ratio	1.104	4	.894

	Value	df	Asymp. Sig. (2-sided)
Linear-by-Linear Association	.002	1	.965
N of Valid Cases	178		

a.   0 cells (.0%) have expected count less than 5. The minimum expected count is 5.21.

Chi-Square Test of Association 18: **not a significant association**

Comparison of Variables
- Do you have any brothers or sisters who have earned a university degree? (categorical variable)
- In university lecture courses, I learned practical skills about my discipline.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.491[a]	4	**.479**
Likelihood Ratio	3.603	4	.462
Linear-by-Linear Association	2.703	1	.100
N of Valid Cases	178		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.19.

Chi-Square Test of Association 19 and corresponding crosstab: **significant association**

Comparison of Variables
- Do you have any brothers or sisters who have earned a university degree? (categorical variable)
- I learned a lot of information from lab courses.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.823[a]	4	**.012**
Likelihood Ratio	11.976	4	.018

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Linear-by-Linear Association	2.773	1	.096
N of Valid Cases	178		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.54.

Crosstab

			For the following statements about your higher education experiences, please select your level of agreement. - I learned a lot of information from lab courses.					
			Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
Do you have any brothers or sisters who have earned a university degree?	Yes	Count	5	31	16	41	27	120
		% within Do you have any brothers or sisters who have earned a university degree?	4.2%	25.8%	13.3%	34.2%	22.5%	100.0%
		% within For the following statements about your higher education experiences, please select your level of agreement. - I learned a lot of information from lab courses.	29.4%	75.6%	69.6%	69.5%	71.1%	67.4%
		% of Total	2.8%	17.4%	9.0%	23.0%	15.2%	67.4%
	No	Count	12	10	7	18	11	58
		% within Do you have any brothers or sisters who have earned a university degree?	20.7%	17.2%	12.1%	31.0%	19.0%	100.0%
		% within For the following statements about your higher education experiences, please select your level of agreement. - I learned a lot of information from lab courses.	70.6%	24.4%	30.4%	30.5%	28.9%	32.6%
		% of Total	6.7%	5.6%	3.9%	10.1%	6.2%	32.6%
Total		Count	17	41	23	59	38	178
		% within Do you have any brothers or sisters who have earned a university degree?	9.6%	23.0%	12.9%	33.1%	21.3%	100.0%
		% within For the following statements about your higher education experiences, please select your level of agreement. - I learned a lot of information from lab courses.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	9.6%	23.0%	12.9%	33.1%	21.3%	100.0%

Chi-Square Test of Association 20: **not a significant association**

Comparison of Variables
- Do you have any brothers or sisters who have earned a university degree? (categorical variable)
- I used the services of the gender office.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.152[a]	4	**.188**
Likelihood Ratio	6.014	4	.198
Linear-by-Linear Association	.351	1	.554
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.27.

Chi-Square Test of Association 21: **not a significant association**

Comparison of Variables
- Do you have any brothers or sisters who have earned a university degree? (categorical variable)
- When I look back at my undergraduate education, I wish I had studied something else.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.964[a]	4	**.411**
Likelihood Ratio	4.171	4	.383
Linear-by-Linear Association	1.974	1	.160
N of Valid Cases	163		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.18.

Chi-Square Test of Association 22: **not a significant association**

Comparison of Variables
- Do you have any brothers or sisters who have earned a university degree? (categorical variable)
- There are many opportunities for recent university graduates in my field.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.448[a]	4	**.654**
Likelihood Ratio	2.515	4	.642
Linear-by-Linear Association	1.757	1	.185
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.20.

Chi-Square Test of Association 23: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- I have people in my family who I can talk to about science and technology careers.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.785[a]	4	**.594**
Likelihood Ratio	2.771	4	.597
Linear-by-Linear Association	.531	1	.466
N of Valid Cases	175		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.28.

Chi-Square Test of Association 24 and corresponding crosstab: **significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.991[a]	4	**.005**
Likelihood Ratio	15.310	4	.004
Linear-by-Linear Association	8.693	1	.003
N of Valid Cases	175		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.91.

Crosstab

			For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.					Total
			Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	
Part 2: Higher Education Experiences Would you consider yourself a fluent English language speaker?	Yes	Count	10	24	7	32	24	97
		% within Part 2: Higher Education Experiences Would you consider yourself a fluent English language speaker?	10.3%	24.7%	7.2%	33.0%	24.7%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	34.5%	54.5%	35.0%	64.0%	75.0%	55.4%
		% of Total	5.7%	13.7%	4.0%	18.3%	13.7%	55.4%
	No	Count	19	20	13	18	8	78
		% within Part 2: Higher Education Experiences Would you consider yourself a fluent English language speaker?	24.4%	25.6%	16.7%	23.1%	10.3%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	65.5%	45.5%	65.0%	36.0%	25.0%	44.6%
		% of Total	10.9%	11.4%	7.4%	10.3%	4.6%	44.6%
Total		Count	29	44	20	50	32	175
		% within Part 2: Higher Education Experiences Would you consider yourself a fluent English language speaker?	16.6%	25.1%	11.4%	28.6%	18.3%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	16.6%	25.1%	11.4%	28.6%	18.3%	100.0%

<u>Chi-Square Test of Association 25:</u> **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- My secondary education sufficiently prepared me for university classes.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.784[a]	4	**.216**
Likelihood Ratio	5.936	4	.204
Linear-by-Linear Association	2.873	1	.090
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.20.

Chi-Square Test of Association 26: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- I was satisfied with my performance on the Ethiopian General Secondary Education Certification Examination (10th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.467a	4	**.167**
Likelihood Ratio	6.565	4	.161
Linear-by-Linear Association	5.065	1	.024
N of Valid Cases	175		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.28.

Chi-Square Test of Association 27: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- I was satisfied with my performance on the Ethiopian University Entrance Examination (12th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.467a	4	**.167**
Likelihood Ratio	6.565	4	.161
Linear-by-Linear Association	5.065	1	.024

N of Valid Cases			
	175		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.28.

Chi-Square Test of Association 28: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- My first year (freshman year) was difficult.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.461[a]	4	**.347**
Likelihood Ratio	4.790	4	.310
Linear-by-Linear Association	2.052	1	.152
N of Valid Cases	177		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.69.

Chi-Square Test of Association 29: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- In university lecture courses, I cared more about understanding the material than I cared about getting high marks.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.512[a]	4	**.825**
Likelihood Ratio	1.516	4	.824

	Value	df	Asymp. Sig. (2-sided)
Linear-by-Linear Association	.041	1	.839
N of Valid Cases	177		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.14.

Chi-Square Test of Association 30: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- In university lecture courses, I learned practical skills about my discipline.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.723[a]	4	**.948**
Likelihood Ratio	.730	4	.948
Linear-by-Linear Association	.376	1	.540
N of Valid Cases	177		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.48.

Chi-Square Test of Association 31: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- I learned a lot of information from lab courses.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.908[a]	4	**.753**
Likelihood Ratio	1.921	4	.750
Linear-by-Linear Association	.547	1	.459
N of Valid Cases	177		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.14.

Chi-Square Test of Association 32: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- I used the services of the gender office.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.030[a]	4	**.553**
Likelihood Ratio	3.055	4	.549
Linear-by-Linear Association	.004	1	.949
N of Valid Cases	175		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.13.

Chi-Square Test of Association 33: **not a significant association**

Comparison of Variables

- Would you consider yourself a fluent English language speaker? (categorical variable)
- When I look back at my undergraduate education, I wish I had studied something else.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.791[a]	4	**.774**
Likelihood Ratio	1.796	4	.773
Linear-by-Linear Association	1.410	1	.235
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.33.

Chi-Square Test of Association 34: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- There are many opportunities for recent university graduates in my field.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.895[a]	4	**.420**
Likelihood Ratio	3.997	4	.406
Linear-by-Linear Association	.220	1	.639
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.13.

Chi-Square Test of Association 35: **not a significant association**

Comparison of Variables
- Would you consider yourself a fluent English language speaker? (categorical variable)
- I consider myself an entrepreneur.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.394a	4	**.116**
Likelihood Ratio	7.421	4	.115
Linear-by-Linear Association	4.607	1	.032
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.14.

Chi-Square Test of Association 36: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- I have people in my family who I can talk to about science and technology careers.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.896a	4	**.420**
Likelihood Ratio	3.866	4	.424

	Value	df	Asymp. Sig. (2-sided)
Linear-by-Linear Association	.614	1	.433
N of Valid Cases	174		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.03.

Chi-Square Test of Association 37: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.668[a]	4	**.453**
Likelihood Ratio	3.702	4	.448
Linear-by-Linear Association	3.039	1	.081
N of Valid Cases	174		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.39.

Chi-Square Test of Association 38: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- My secondary education sufficiently prepared me for university classes.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.968[a]	4	**.202**
Likelihood Ratio	6.079	4	.193
Linear-by-Linear Association	.018	1	.894
N of Valid Cases	175		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.92.

Chi-Square Test of Association 39: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- I was satisfied with my performance on the Ethiopian General Secondary Education Certification Examination (10th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.527[a]	4	**.163**
Likelihood Ratio	6.573	4	.160
Linear-by-Linear Association	3.570	1	.059
N of Valid Cases	174		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.10.

Chi-Square Test of Association 40: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- I was satisfied with my performance on the Ethiopian University Entrance Examination (12th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.682[a]	4	**.612**
Likelihood Ratio	2.670	4	.614
Linear-by-Linear Association	2.152	1	.142
N of Valid Cases	175		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.92.

Chi-Square Test of Association 41: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- My first year (freshman year) was difficult.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.332[a]	4	**.988**
Likelihood Ratio	.330	4	.988
Linear-by-Linear Association	.159	1	.690
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.31.

Chi-Square Test of Association 42: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- In university lecture courses, I cared more about understanding the material than I cared about getting high marks.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.725[a]	4	**.605**
Likelihood Ratio	2.791	4	.593
Linear-by-Linear Association	.873	1	.350
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.73.

Chi-Square Test of Association 43: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- In university lecture courses, I learned practical skills about my discipline.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.728[a]	4	**.786**
Likelihood Ratio	1.733	4	.785
Linear-by-Linear Association	.368	1	.544
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.99.

Chi-Square Test of Association 44: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- I learned a lot of information from lab courses.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.462[a]	4	**.347**
Likelihood Ratio	4.423	4	.352
Linear-by-Linear Association	1.038	1	.308
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.73.

Chi-Square Test of Association 45: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- I used the services of the gender office.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.453[a]	4	**.244**
Likelihood Ratio	5.801	4	.214
Linear-by-Linear Association	.330	1	.566
N of Valid Cases	174		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.71.

Chi-Square Test of Association 46: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- When I look back at my undergraduate education, I wish I had studied something else.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.349a	4	**.672**
Likelihood Ratio	2.441	4	.655
Linear-by-Linear Association	.518	1	.472
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.79.

Chi-Square Test of Association 47: **not a significant association**

Comparison of Variables
- As a university student, was your assigned campus your first choice? (categorical variable)
- There are many opportunities for recent university graduates in my field.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.952a	4	**.745**
Likelihood Ratio	1.962	4	.743
Linear-by-Linear Association	.770	1	.380
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.61.

Chi-Square Test of Association 48: **not a significant association**

Comparison of Variables

- As a university student, was your assigned campus your first choice? (categorical variable)
- I consider myself an entrepreneur.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.165[a]	4	**.384**
Likelihood Ratio	4.214	4	.378
Linear-by-Linear Association	.100	1	.752
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.74.

Chi-Square Test of Association 49: **not a significant association**

Comparison of Variables
- As a university student, was your assigned discipline your first choice? (categorical variable)
- The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.658[a]	4	**.454**
Likelihood Ratio	3.501	4	.478
Linear-by-Linear Association	2.059	1	.151
N of Valid Cases	174		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.09.

Chi-Square Test of Association 50: **not a significant association**

Comparison of Variables
- As a university student, was your assigned discipline your first choice? (categorical variable)
- In university lecture courses, I cared more about understanding the material than I cared about getting high marks.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.092[a]	4	**.542**
Likelihood Ratio	2.912	4	.573
Linear-by-Linear Association	1.057	1	.304
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.00.

Chi-Square Test of Association 51: **not a significant association**

Comparison of Variables
- As a university student, was your assigned discipline your first choice? (categorical variable)
- In university lecture courses, I learned practical skills about my discipline.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.041[a]	4	**.551**
Likelihood Ratio	3.057	4	.548
Linear-by-Linear Association	.093	1	.760
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.94.

Chi-Square Test of Association 52: **not a significant association**

Comparison of Variables
- As a university student, was your assigned discipline your first choice? (categorical variable)
- I learned a lot of information from lab courses.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.927[a]	4	**.921**
Likelihood Ratio	.925	4	.921
Linear-by-Linear Association	.758	1	.384
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.00.

Chi-Square Test of Association 53: **not a significant association**

Comparison of Variables
- As a university student, was your assigned discipline your first choice? (categorical variable)
- When I look back at my undergraduate education, I wish I had studied something else.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.507[a]	4	**.342**
Likelihood Ratio	4.545	4	.337
Linear-by-Linear Association	2.918	1	.088
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.14.

Chi-Square Test of Association 54: **not a significant association**

Comparison of Variables
- As a university student, was your assigned discipline your first choice? (categorical variable)

- There are many opportunities for recent university graduates in my field.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.430[a]	4	**.657**
Likelihood Ratio	2.353	4	.671
Linear-by-Linear Association	.077	1	.781
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.78.

Chi-Square Test of Association 55: **not a significant association**

Comparison of Variables
- Did you participate in an internship while you were an undergraduate student? (categorical variable)
- The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.608[a]	4	**.625**
Likelihood Ratio	2.638	4	.620
Linear-by-Linear Association	.119	1	.731
N of Valid Cases	174		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.78.

Chi-Square Test of Association 56: **not a significant association**

Comparison of Variables
- Did you participate in an internship while you were an undergraduate student? (categorical variable)
- My first year (freshman year) was difficult.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.990[a]	4	**.559**
Likelihood Ratio	3.110	4	.540
Linear-by-Linear Association	.702	1	.402
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.20.

Chi-Square Test of Association 57: **not a significant association**

Comparison of Variables
- Did you participate in an internship while you were an undergraduate student? (categorical variable)
- In university lecture courses, I cared more about understanding the material than I cared about getting high marks.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.439[a]	4	**.114**
Likelihood Ratio	7.448	4	.114

	Value	df	Asymp. Sig. (2-sided)
Linear-by-Linear Association	1.754	1	.185
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.55.

Chi-Square Test of Association 58: **not a significant association**

Comparison of Variables
- Did you participate in an internship while you were an undergraduate student? (categorical variable)
- In university lecture courses, I learned practical skills about my discipline.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.333[a]	4	**.363**
Likelihood Ratio	4.722	4	.317
Linear-by-Linear Association	1.787	1	.181
N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.59.

Chi-Square Test of Association 59: **not a significant association**

Comparison of Variables
- Did you participate in an internship while you were an undergraduate student? (categorical variable)
- I learned a lot of information from lab courses.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.688[a]	4	**.793**
Likelihood Ratio	1.700	4	.791
Linear-by-Linear Association	.513	1	.474

N of Valid Cases	176		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.55.

Chi-Square Test of Association 60: **not a significant association**

Comparison of Variables
- Did you participate in an internship while you were an undergraduate student? (categorical variable)
- I used the services of the gender office.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.155[a]	4	**.532**
Likelihood Ratio	3.221	4	.522
Linear-by-Linear Association	2.166	1	.141
N of Valid Cases	174		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.52.

Chi-Square Test of Association 61: **not a significant association**

Comparison of Variables
- Did you participate in an internship while you were an undergraduate student? (categorical variable)
- When I look back at my undergraduate education, I wish I had studied something else.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.362[a]	4	**.174**

	Value	df	Asymp. Sig. (2-sided)
Likelihood Ratio	6.429	4	.169
Linear-by-Linear Association	2.771	1	.096
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.49.

Chi-Square Test of Association 62: **not a significant association**

Comparison of Variables
- Did you participate in an internship while you were an undergraduate student? (categorical variable)
- There are many opportunities for recent university graduates in my field.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.330[a]	4	**.675**
Likelihood Ratio	2.379	4	.666
Linear-by-Linear Association	.289	1	.591
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.17.

Chi-Square Test of Association 63: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- I have people in my family who I can talk to about science and technology careers.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.377[a]	4	**.251**

	Value	df	
Likelihood Ratio	5.488	4	.241
Linear-by-Linear Association	.038	1	.845
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.43.

Chi-Square Test of Association 64 and corresponding crosstab: **a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.333[a]	4	**.035**
Likelihood Ratio	10.683	4	.030
Linear-by-Linear Association	6.688	1	.010
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.38.

Crosstab

			For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.					Total
			Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	
Did you stay (or plan to stay) in the same city as your undergraduate university?	Yes	Count	7	20	8	24	20	79
		% within Did you stay (or plan to stay) in the same city as your undergraduate university?	8.9%	25.3%	10.1%	30.4%	25.3%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	25.0%	51.3%	42.1%	57.1%	62.5%	49.4%
		% of Total	4.4%	12.5%	5.0%	15.0%	12.5%	49.4%
	No	Count	21	19	11	18	12	81
		% within Did you stay (or plan to stay) in the same city as your undergraduate university?	25.9%	23.5%	13.6%	22.2%	14.8%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	75.0%	48.7%	57.9%	42.9%	37.5%	50.6%
		% of Total	13.1%	11.9%	6.9%	11.3%	7.5%	50.6%
Total		Count	28	39	19	42	32	160
		% within Did you stay (or plan to stay) in the same city as your undergraduate university?	17.5%	24.4%	11.9%	26.3%	20.0%	100.0%
		% within For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	17.5%	24.4%	11.9%	26.3%	20.0%	100.0%

<u>Chi-Square Test of Association 65</u>: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- My secondary education sufficiently prepared me for university classes.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.178[a]	4	**.186**
Likelihood Ratio	6.255	4	.181
Linear-by-Linear Association	4.948	1	.026
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.96.

Chi-Square Test of Association 66: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- I was satisfied with my performance on the Ethiopian General Secondary Education Certification Examination (10th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.619[a]	4	**.071**
Likelihood Ratio	8.815	4	.066
Linear-by-Linear Association	4.148	1	.042
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.43.

Chi-Square Test of Association 67: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- I was satisfied with my performance on the Ethiopian University Entrance Examination (12th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.033[a]	4	**.197**
Likelihood Ratio	6.131	4	.190
Linear-by-Linear Association	5.930	1	.015
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.46.

Chi-Square Test of Association 68: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- My first year (freshman year) was difficult.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.907[a]	4	**.753**
Likelihood Ratio	1.915	4	.751
Linear-by-Linear Association	.015	1	.902
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.50.

Chi-Square Test of Association 69: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- Freshman orientation was helpful.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.349[a]	4	**.501**
Likelihood Ratio	3.437	4	.488
Linear-by-Linear Association	.042	1	.837
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.50.

Chi-Square Test of Association 70: **not a significant association**

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Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- In university lecture courses, I cared more about understanding the material than I cared about getting high marks.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.719[a]	4	**.317**
Likelihood Ratio	4.760	4	.313
Linear-by-Linear Association	1.190	1	.275
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.50.

Chi-Square Test of Association 71: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- In university lecture courses, I learned practical skills about my discipline.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.908[a]	4	**.206**
Likelihood Ratio	6.026	4	.197
Linear-by-Linear Association	2.176	1	.140
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.50.

Chi-Square Test of Association 72: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- I learned a lot of information from lab courses.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.801[a]	4	**.215**
Likelihood Ratio	5.889	4	.208
Linear-by-Linear Association	3.456	1	.063
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.00.

Chi-Square Test of Association 73 and corresponding crosstab: **a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- I used the services of the gender office.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.624[a]	4	**.047**
Likelihood Ratio	10.136	4	.038
Linear-by-Linear Association	2.892	1	.089

			N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.00.

Crosstab

			For the following statements about your higher education experiences, please select your level of agreement. - I used the services of the gender office.					Total
			Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	
Did you stay (or plan to stay) in the same city as your undergraduate university?	Yes	Count	20	19	16	12	13	80
		% within Did you stay (or plan to stay) in the same city as your undergraduate university?	25.0%	23.8%	20.0%	15.0%	16.3%	100.0%
		% within For the following statements about your higher education experiences, please select your level of agreement. - I used the services of the gender office.	50.0%	38.8%	57.1%	44.4%	81.3%	50.0%
		% of Total	12.5%	11.9%	10.0%	7.5%	8.1%	50.0%
	No	Count	20	30	12	15	3	80
		% within Did you stay (or plan to stay) in the same city as your undergraduate university?	25.0%	37.5%	15.0%	18.8%	3.8%	100.0%
		% within For the following statements about your higher education experiences, please select your level of agreement. - I used the services of the gender office.	50.0%	61.2%	42.9%	55.6%	18.8%	50.0%
		% of Total	12.5%	18.8%	7.5%	9.4%	1.9%	50.0%
Total		Count	40	49	28	27	16	160
		% within Did you stay (or plan to stay) in the same city as your undergraduate university?	25.0%	30.6%	17.5%	16.9%	10.0%	100.0%
		% within For the following statements about your higher education experiences, please select your level of agreement. - I used the services of the gender office.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	25.0%	30.6%	17.5%	16.9%	10.0%	100.0%

Chi-Square Test of Association 74: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- When I look back at my undergraduate education, I wish I had studied something else.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.662[a]	4	**.956**
Likelihood Ratio	.663	4	.956
Linear-by-Linear Association	.293	1	.588
N of Valid Cases	162		

354

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.50.

Chi-Square Test of Association 75: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- There are many opportunities for recent university graduates in my field.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.078[a]	4	**.545**
Likelihood Ratio	3.090	4	.543
Linear-by-Linear Association	.065	1	.798
N of Valid Cases	161		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.93.

Chi-Square Test of Association 76: **not a significant association**

Comparison of Variables
- Did you stay (or plan to stay) in the same city as your undergraduate university? (categorical variable)
- I consider myself an entrepreneur.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.047[a]	4	**.550**
Likelihood Ratio	3.082	4	.544
Linear-by-Linear Association	.131	1	.717
N of Valid Cases	162		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.50.

Chi-Square Test of Association 77: **not a significant association**

Comparison of Variables
- Are you in the same field as what you studied in university? (categorical variable)
- The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.024[a]	4	**.731**
Likelihood Ratio	2.057	4	.725
Linear-by-Linear Association	.102	1	.750
N of Valid Cases	158		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.05.

Chi-Square Test of Association 78: **not a significant association**

Comparison of Variables
- Are you in the same field as what you studied in university? (categorical variable)
- When I look back at my undergraduate education, I wish I had studied something else.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.067[a]	4	**.280**
Likelihood Ratio	5.193	4	.268
Linear-by-Linear Association	3.430	1	.064
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.11.

Chi-Square Test of Association 79: **not a significant association**

Comparison of Variables
- Are you in the same field as what you studied in university? (categorical variable)
- There are many opportunities for recent university graduates in my field.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.258[a]	4	**.869**
Likelihood Ratio	1.203	4	.878
Linear-by-Linear Association	.826	1	.364
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.91.

Chi-Square Test of Association 80: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.149[a]	4	**.128**
Likelihood Ratio	7.485	4	.112
Linear-by-Linear Association	.889	1	.346
N of Valid Cases	158		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.70.

Chi-Square Test of Association 81: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- My secondary education sufficiently prepared me for university classes.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.662[a]	4	**.616**
Likelihood Ratio	2.638	4	.620
Linear-by-Linear Association	.087	1	.769
N of Valid Cases	159		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.72.

Chi-Square Test of Association 82: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- I was satisfied with my performance on the Ethiopian University Entrance Examination (12th grade exam).

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.628[a]	4	**.106**
Likelihood Ratio	7.786	4	.100
Linear-by-Linear Association	1.167	1	.280
N of Valid Cases	159		

358

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.31.

Chi-Square Test of Association 83: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- My first year (freshman year) was difficult.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.738[a]	4	**.784**
Likelihood Ratio	1.709	4	.789
Linear-by-Linear Association	.095	1	.758
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.36.

Chi-Square Test of Association 84: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- In university lecture courses, I cared more about understanding the material than I cared about getting high marks.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.336[a]	4	**.080**

	Value	df	Asymp. Sig. (2-sided)
Likelihood Ratio	8.783	4	.067
Linear-by-Linear Association	.066	1	.797
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.19.

Chi-Square Test of Association 85 and corresponding crosstab: **a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- In university lecture courses, I learned practical skills about my discipline.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.423[a]	4	**.022**
Likelihood Ratio	11.778	4	.019
Linear-by-Linear Association	2.888	1	.089
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.43.

			For the following statements about your higher education experiences, please select your level of agreement. - In university lecture courses, I learned practical skills about my discipline.					Total
			Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	
Are you interested in working professionally outside of Ethiopia? - Selected Choice	Yes (please include where)	Count	10	23	20	26	15	94
		% within Are you interested in working professionally outside of Ethiopia? - Selected Choice	10.6%	24.5%	21.3%	27.7%	16.0%	100.0%
		% within For the following statements about your higher education experiences, please select your level of agreement. - In university lecture courses, I learned practical skills about my discipline.	55.6%	74.2%	76.9%	44.8%	55.6%	58.8%
		% of Total	6.3%	14.4%	12.5%	16.3%	9.4%	58.8%
	No	Count	8	8	6	32	12	66
		% within Are you interested in working professionally outside of Ethiopia? - Selected Choice	12.1%	12.1%	9.1%	48.5%	18.2%	100.0%
		% within For the following statements about your higher education experiences, please select your level of agreement. - In university lecture courses, I learned practical skills about my discipline.	44.4%	25.8%	23.1%	55.2%	44.4%	41.3%
		% of Total	5.0%	5.0%	3.8%	20.0%	7.5%	41.3%
Total		Count	18	31	26	58	27	160
		% within Are you interested in working professionally outside of Ethiopia? - Selected Choice	11.3%	19.4%	16.3%	36.3%	16.9%	100.0%
		% within For the following statements about your higher education experiences, please select your level of agreement. - In university lecture courses, I learned practical skills about my discipline.	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	11.3%	19.4%	16.3%	36.3%	16.9%	100.0%

Chi-Square Test of Association 86: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- I learned a lot of information from lab courses.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.980[a]	4	**.062**
Likelihood Ratio	9.862	4	.043
Linear-by-Linear Association	7.679	1	.006
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.60.

Chi-Square Test of Association 87: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- I used the services of the gender office.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.693[a]	4	**.320**
Likelihood Ratio	4.727	4	.316
Linear-by-Linear Association	2.190	1	.139
N of Valid Cases	158		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.58.

Chi-Square Test of Association 88: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- When I look back at my undergraduate education, I wish I had studied something else.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.792[a]	4	**.435**
Likelihood Ratio	3.830	4	.429
Linear-by-Linear Association	3.046	1	.081
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.84.

Chi-Square Test of Association 89: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- There are many opportunities for recent university graduates in my field.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.401[a]	4	**.116**
Likelihood Ratio	7.582	4	.108
Linear-by-Linear Association	.545	1	.460
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.08.

Chi-Square Test of Association 90: **not a significant association**

Comparison of Variables
- Are you interested in working professionally outside of Ethiopia? (categorical variable)
- I consider myself an entrepreneur.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.435[a]	4	**.838**
Likelihood Ratio	1.432	4	.839
Linear-by-Linear Association	.114	1	.735
N of Valid Cases	160		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.19.

**Appendix T – Assumptions for Linear Regression**

Assumption 1: Requirement for Linear Relationship is Met
In this data, the outcome variable was continuous (GPA), while the three predictor
variables were responses to Likert scale items (2) and one dichotomous question. The
scatter plots below demonstrate the relationship between the Likert scale questions and
the outcome variable (the dichotomous predictor variable has been excluded). Due to the
distribution of Likert scale items, a linear relationship (StatisticsSolutions, 2018) was not
immediately detected between the outcome and predictors (see Appendix T - Table 1 and
Table). Instead, a correlation matrix, scatter-plot of residuals, and histogram of residuals
was used to determine a relationship between the outcome and two Likert scale predictor
variables (see Appendix T, Tables 3-5, respectively).
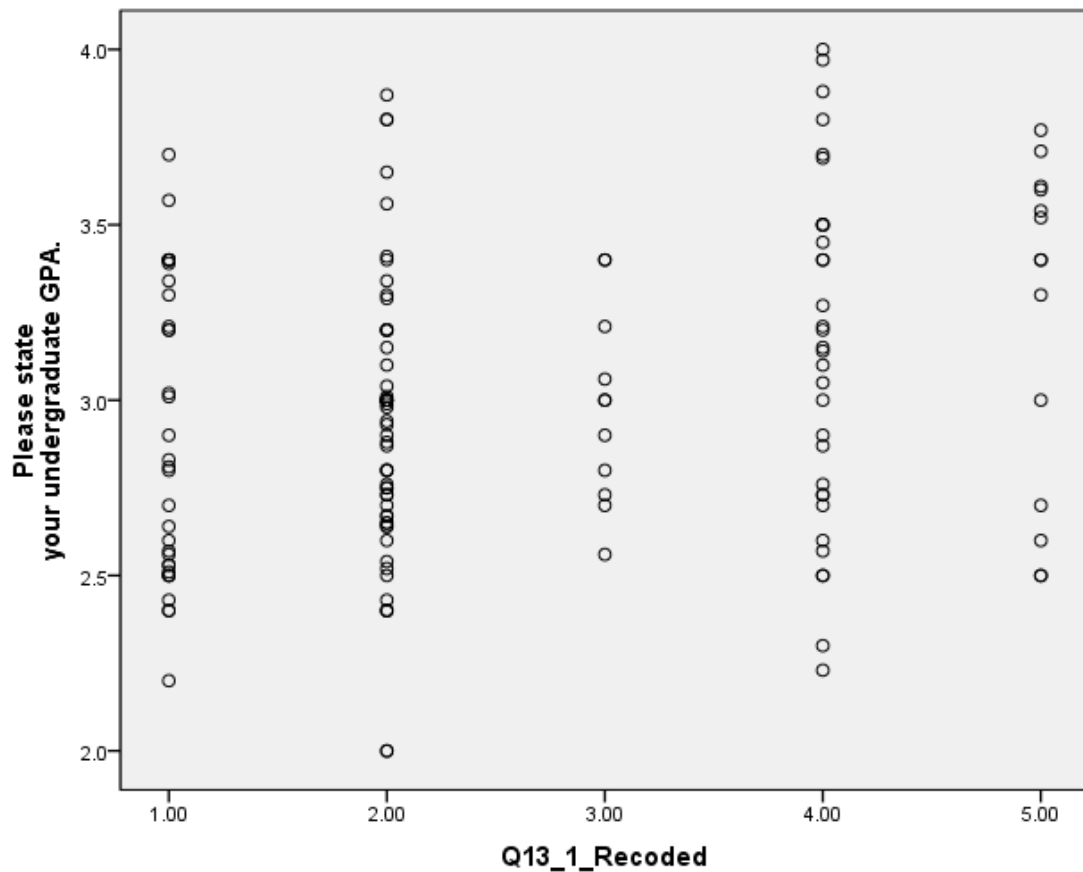
**Appendix T, Table 1 – GPA Dependence on perception of difficulty of first
year.** Likert scale question was recoded because it measured a negative perception. Thus,
the higher a respondent's score on this item, the more negative experience. I recoded it so
that the ordered category would make more intuitive sense with the outcome measure.
Specifically, the re-coded variable allows a lower score to reflect a negative perception

and a higher score to reflect a positive perception. Analytically, I assumed that higher GPAs are associated with more positive experiences.
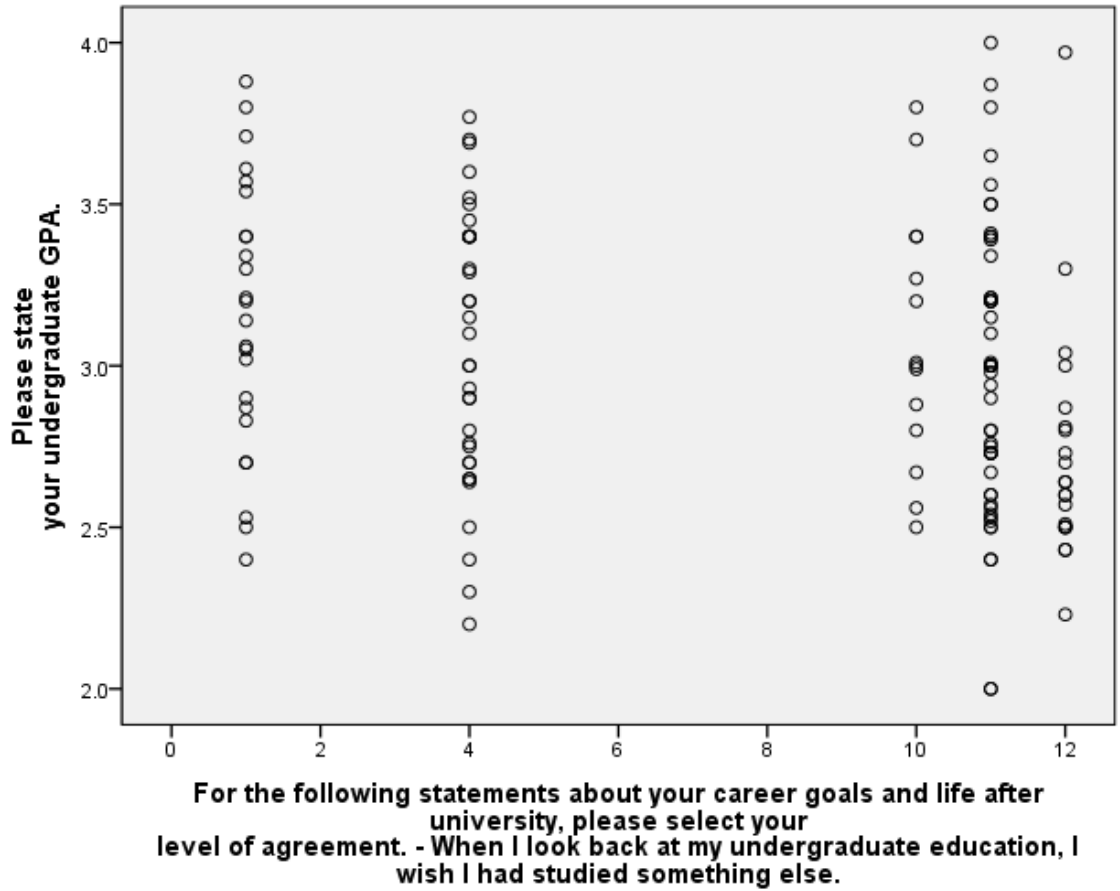
Appendix T, Table 2 – GPA Dependence on satisfaction of college measure (measured by the Likert scale item).
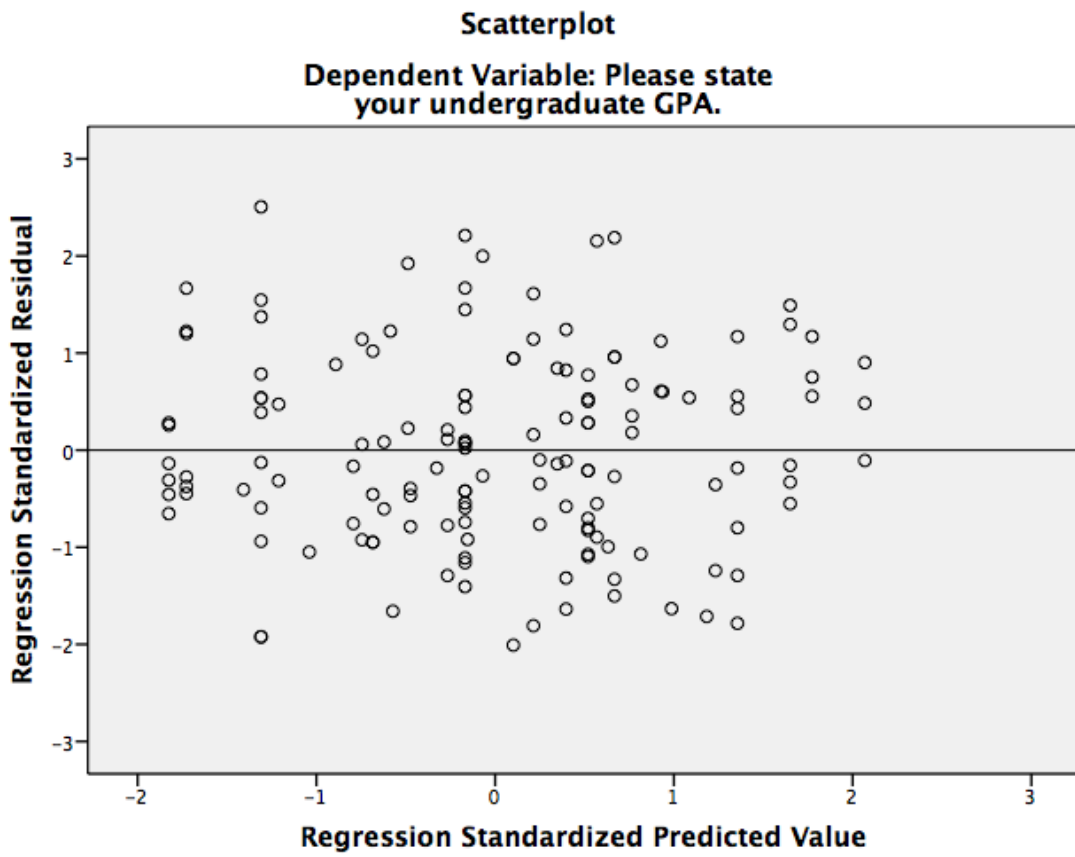
Correlations

		Please state your undergraduate GPA.	Q13_1_Recoded	For the following statements about your career goals and life after university, please select your level of agreement. - When I look back at my undergraduate education, I wish I had studied something else.
Please state your undergraduate GPA.	Pearson Correlation	1	.263[**]	-.226[**]
	Sig. (2-tailed)		.001	.006
	N	147	147	145
Q13_1_Recoded	Pearson Correlation	.263[**]	1	-.177[*]
	Sig. (2-tailed)	.001		.024
	N	147	178	163
For the following statements about your career goals and life after university, please select your level of agreement. - When I look back at my undergraduate education, I wish I had studied something else.	Pearson Correlation	-.226[**]	-.177[*]	1
	Sig. (2-tailed)	.006	.024	
	N	145	163	163

[**]. Correlation is significant at the 0.01 level (2-tailed).

[*]. Correlation is significant at the 0.05 level (2-tailed).

Appendix T, Table 3 – Correlation between GPA and Predictors. The correlation coefficients for the predictors (DIFFICULTY and SATISFICATION) are 0.263 AND -0.226, respectively. These correlations are considered weak according to J. D. Evans (1996). However, they are not 0, and thus imply a linear relationship between Likert-scale predictors and the outcome variable.

Scatterplot

Dependent Variable: Please state your undergraduate GPA.

Appendix T, Table 4 – Scatterplot of Regression Residuals

Histogram

Dependent Variable: Please state your undergraduate GPA.

Mean = −3.09E−16
Std. Dev. = 0.989
N = 144
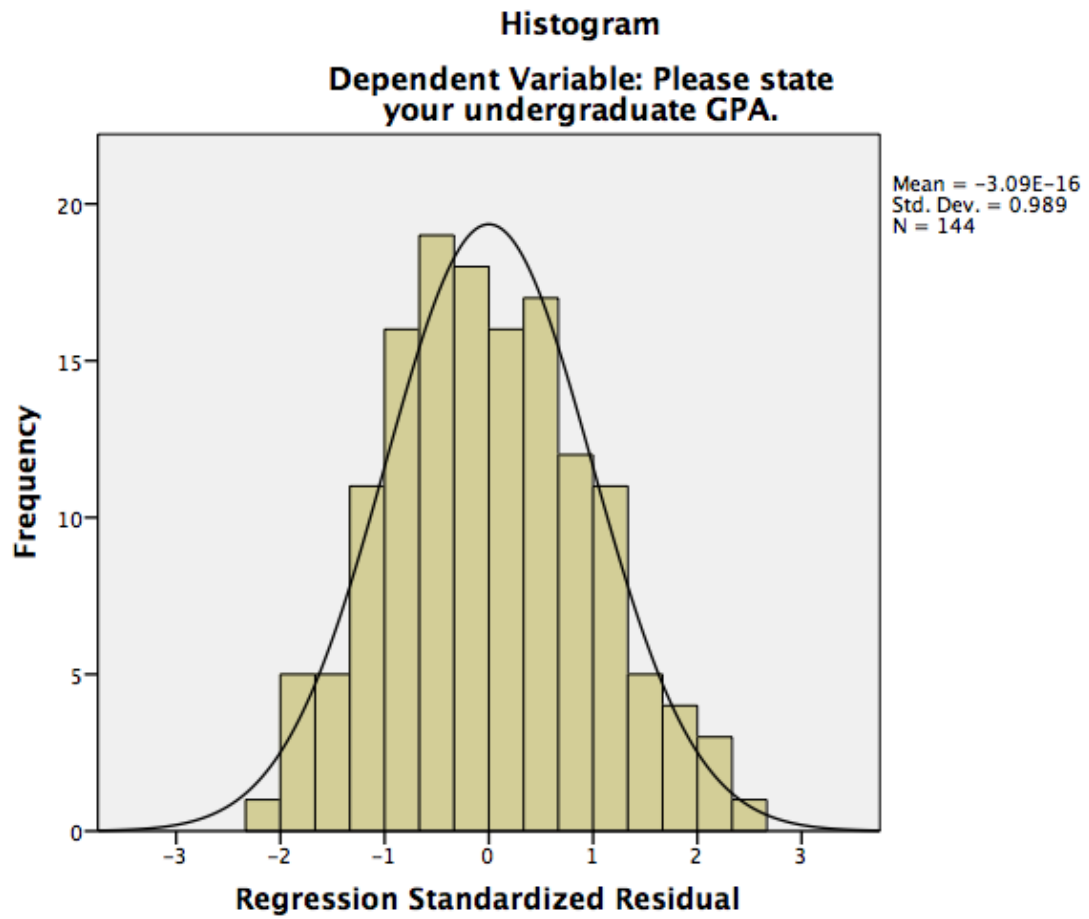
Appendix T, Table 5 – Histogram of Regression Residuals

Assumption 2: Requirement for Multivariate Normality is Met

        To assess the normality of the two Likert scale predictor variables, skewness was assessed. Skewness is a measure of deviation from symmetry around the mean (Brown, 1997). As the table below shows, all skewness values for the independent variables were between +/-1. Specifically, the skewness value for the DIFFICULTY variable (recoded) is 0.439, which indicates that there was a greater number of smaller values around the mean for this variable. Meanwhile, the skewness value for the SATISFACTION variable is -0.551, which indicates that there was a greater number of larger values around the mean for this variable.

Descriptive Statistics

|	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Please state your undergraduate GPA.	147	2	4	2.99	.434	.188	.214	.200	-.609	.397
Q13_1_Recoded	178	1.00	5.00	2.5899	1.26460	1.599	.439	.182	-.991	.362
As a university student, was your assigned discipline your first choice? - Selected Choice	176	1	2	1.31	.465	.216	.816	.183	-1.350	.364
For the following statements about your career goals and life after university, please select your level of agreement. - When I look back at my undergraduate education, I wish I had studied something else.	163	1	12	7.79	4.210	17.725	-.551	.190	-1.449	.378
Valid N (listwise)	144									

Assumption 3 – Requirement for Normality of Residuals is Met

To test for normality of residuals, a normal probability plot was examined. There are two types of probability plots: Q-Q plots and P-P plots. The former plots the actual values of the independent variable along a line of theoretical values. The latter plots the area under the curve for actual verses the theoretical values (Grace-Martin, 2018). The P-P below shows the cumulative distribution function for the predictor variables in this dataset. Based on a visual assessment of the plot, the distribution is mostly normal since the plotted points fall mostly along the line (which shows the theoretical values of X in a normal distribution).

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: Please state your undergraduate GPA.

370
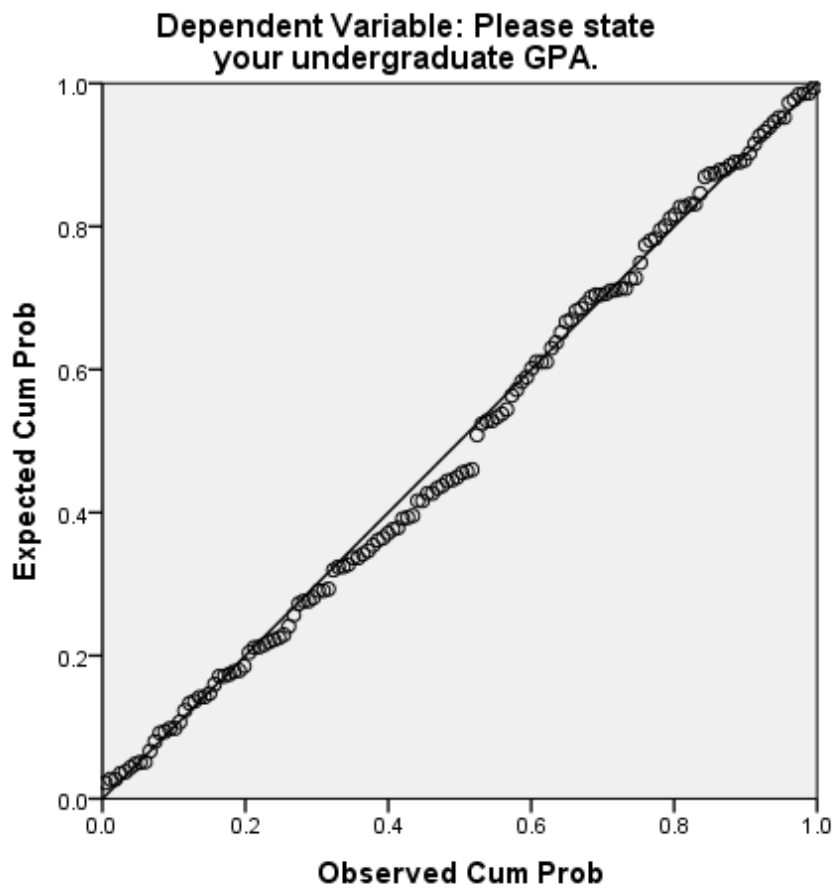
Assumption 4 – Requirement for Homoscedasticity is Met

      A residual scatter plot was used to assess homoscedasticity. Residual scatter plots show   predicted values for the independent variable plotted against errors of prediction. In these plots, if there is no clustering or clear pattern, then there is homogeneity of variance (StatisticsSolutions, 2018). As the figure below shows, the assumption for homoscedasticity has been met for this data set because there is no pattern in how the values are scattered.

Scatterplot

Dependent Variable: Please state your undergraduate GPA.
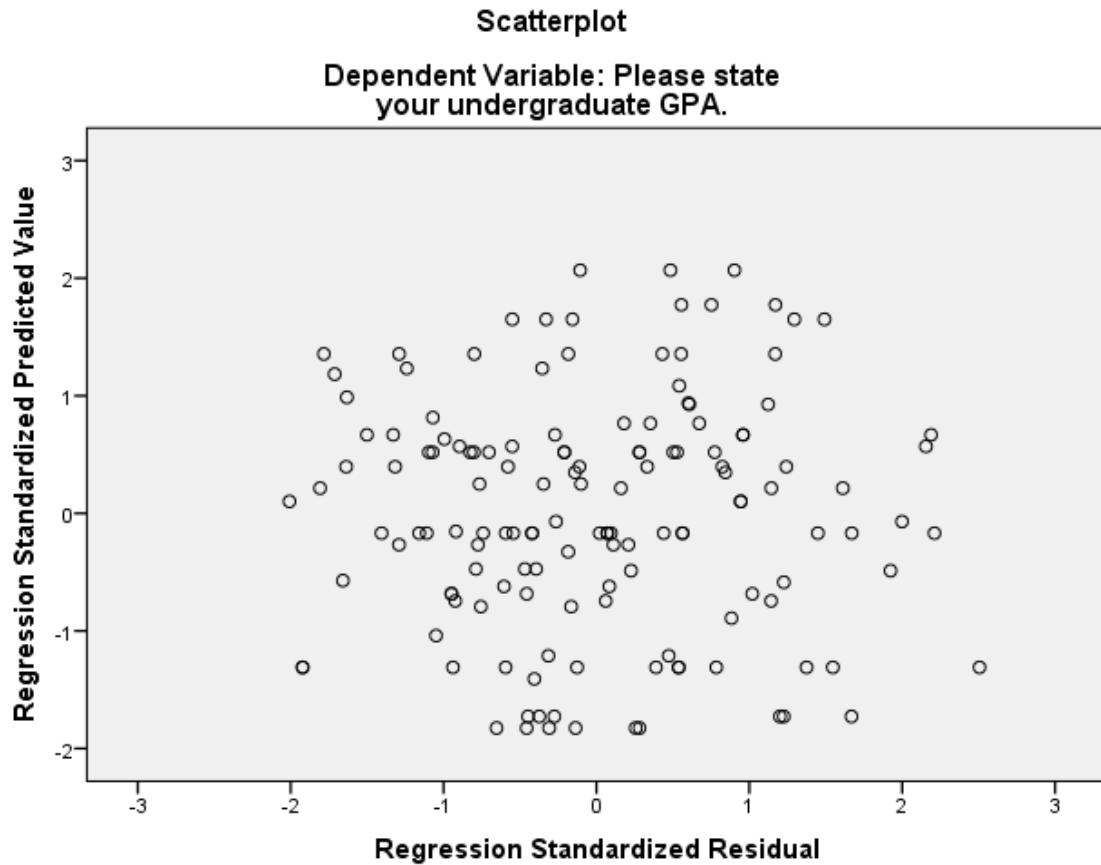
Assumption 5 – Requirement for No/Little Multicollinearity is Met

Multicollinearity occurs when there is high inter-association between predictor variables (StatisticsSolutions, 2018). To assess multicollinearity, values for the variance inflation factor (VIF) were assessed. Generally, if VIF values are lower than 10, then there is little or no multicollinearity in the data. As the table below shows, VIF requirements were met.

	Coefficients[a]							
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	**VIF**
	(Constant)	3.619	.133		27.258	.000		
	For the following statements about your higher education experiences, please select your level of agreement. - My first year (freshman year) was difficult.	-.070	.027	-.209	-2.611	.010	.960	**1.041**
	As a university student, was your assigned discipline your first choice? - Selected Choice	-.189	.074	-.206	-2.565	.011	.955	**1.047**

For the following statements about your career goals and life after university, please select your level of agreement. - When I look back at my undergraduate education, I wish I had studied something else.	-.017	.008	-.160	-1.989	.049	.950	**1.053**

a. Dependent Variable: Please state your undergraduate GPA.

Appendix U – List of Accredited Public Universities in Ethiopia

University	City	Website	Abbreviation
Adama University	Nazret	http://www.adama-university.net/	ADU
Addis Ababa University	Addis Ababa	http://aau.edu.et	AAU
Addis Ababa Science and Technology University	Addis Ababa		AASTU
Adigrat University	Adigrat		AGU
Aksum University	Axum	http://aksumuniversity.org/	AXU
Ambo University College	Ambo	http://www.ambou.edu.et/	AUC
Arba Minch University	Arba Minch	http://amu.edu.et	AMU
Asosa University	Asosa		ASU
Bahir Dar University	Bahir Dar	http://www.bdu.edu.et/	BDU
Bule Hora University	Bule Hora		BHU
Debre Birhan University	Debre Birhan	http://www.dbu.edu.et/	DBU
Debre Markos University	Debre Markos	http://www.dmu.edu.et/	DMU
Debre Tabor University	Debre Tabor		DTU
Dilla University	Dilla	http://www.dillauniversity.edu.et/	DU
Dire Dawa University	Dire Dawa	http://www.ddu.edu.et/	DDU

Gonder University	Gonder	http://www.uog.edu.et/	UOG
Haramaya University	Haramaya	http://www.haramaya.edu.et/	HRU
Hawass University	Hawassa	http://www.hu.edu.et/	HU
Jijiga University	Jijiga	http://www.jju.edu.et/	JJU
Jimma University	Jimma	http://www.ju.edu.et/	JU
Mada Walabu University	Robe / Bale	http://www.mwu.edu.et	MWU
Mekelle University	Mekelle	http://www.mu.edu.et/	MU
Metu University	Metu		MEU
Mizan Tepi University	Mizzan		MTU
Semera University	Semera	http://www.su.edu.et/	SU
Wachamo University	Wachamo		WCU
Welkite University	Welkite		WKU
Wolaita Sodo University	Sodo	http://www.wsu.edu.et/	WSU
Woldiya University	Woldiya		WDU
Wollega University	Nekemt	http://www.wuni.edu.et/	WOU
Wollo University	Dessie	http://www.wu.edu.et/	WU

List provided by Federal Ministry of Education: http://info.moe.gov.et/pubuni.shtml

Appendix V – Visual Summary of Codes from NVivo
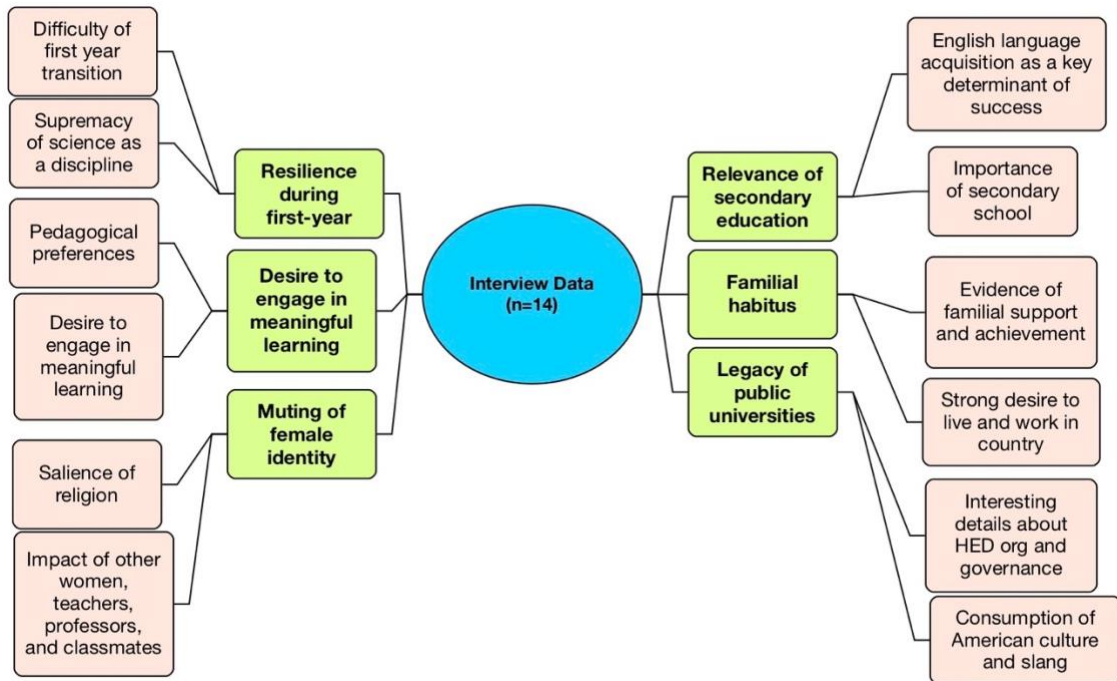

Diagram 1 – NVivo Coding Tree
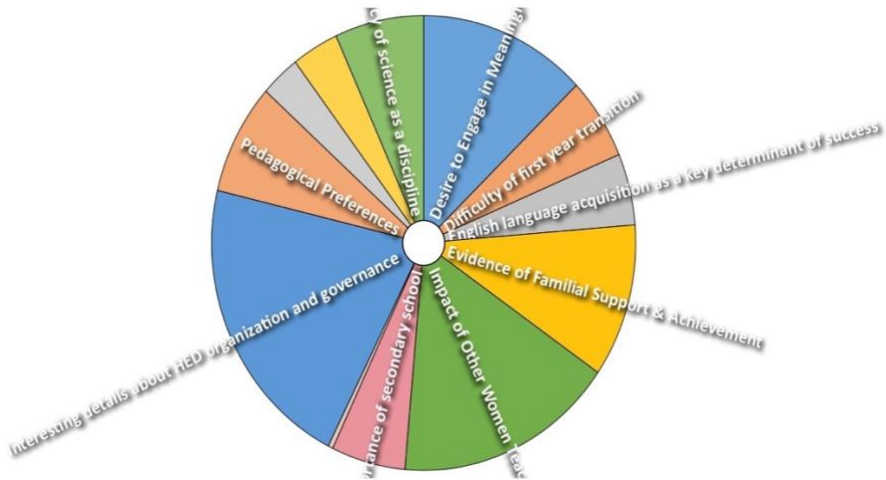
Diagram 2 – NVivo Sunburst Chart

Diagram 3 – NVivo Hierarchy Chart

Appendix W – Regression Model Summary

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
					Change Statistics				
1	.382^a	.146	.128	.406	.146	7.982	3	140	.000

a. Predictors: (Constant), As a
university student, was your assigned discipline your first choice? - Selected Choice,
Q13_1_Recoded, For the following statements about your career goals and life after
university, please select your
level of agreement. - When I look back at my undergraduate education, I wish I had
studied something else.
b. Dependent Variable: Please state
your undergraduate GPA.

Appendix X – Bivariate Correlation SPSS Outputs

Correlation #1: Desire to stay in the same city as university [Q15] and use of gender office [Q13_9].

Correlations

		Did you stay (or plan to stay) in the same city as your undergraduate university?	For the following statements about your higher education experiences, please select your level of agreement. - I used the services of the gender office.
Did you stay (or plan to stay) in the same city as your undergraduate university?	Pearson Correlation	1	-.135
	Sig. (2-tailed)		**.089**
	N	162	160
For the following statements about your higher education experiences, please select your level of agreement. - I used the services of the gender office.	Pearson Correlation	-.135	1
	Sig. (2-tailed)	.089	
	N	160	176

Not a significant correlation.

Correlation #2: Fluency in English [Q8] and adequacy of course materials in high school [Q7_4].

Correlations

		For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	Part 2: Higher Education Experiences Would you consider yourself a fluent English language speaker?
For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	Pearson Correlation	1	-.224**
	Sig. (2-tailed)		**.003**
	N	202	175
Part 2: Higher Education Experiences Would you consider yourself a fluent English language speaker?	Pearson Correlation	-.224**	1
	Sig. (2-tailed)	.003	
	N	175	177

**. Correlation is significant at the 0.01 level (2-tailed).

Significant correlation exists.

Correlation #3: University education of parents [Q2] and feeling like you have people to talk to about science/tech careers [Q7_3].

Correlations

		Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	For the following statements about your family and secondary education, please select your level of agreement. - I have people in my family who I can talk to about science and technology careers.
Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	Pearson Correlation	1	-.233**
	Sig. (2-tailed)		**.001**
	N	204	202
For the following statements about your family and	Pearson Correlation	-.233**	1
	Sig. (2-tailed)	.001	

		secondary education, please select your level of agreement. - I have people in my family who I can talk to about science and technology careers.	
	N	202	202

**. Correlation is significant at the 0.01 level (2-tailed).

Significant correlation exists.

Correlation #4: University education of parents [Q2] and adequacy of course materials in high school [Q7_4].

Correlations

		Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.
Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	Pearson Correlation	1	-.221**
	Sig. (2-tailed)		**.002**
	N	204	202
	Pearson Correlation	-.221**	1

| For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate. | Sig. (2-tailed) | .002 | |
| | N | 202 | 202 |

**. Correlation is significant at the 0.01 level (2-tailed).
Significant correlation exists.

Correlation #5: University education of parents [Q2] and feeling prepared for university classes [Q7_10].

Correlations

		Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	For the following statements about your family and secondary education, please select your level of agreement. - My secondary education sufficiently prepared me for university classes.
	Pearson Correlation	1	-.264**
	Sig. (2-tailed)		.000

Part 1: Family and Secondary Education Background Have either of your parents earned a university degree?	N		204	203
For the following statements about your family and secondary education, please select your level of agreement. - My secondary education sufficiently prepared me for university classes.	Pearson Correlation Sig. (2-tailed) N		-.264** .000 203	1 203

**. Correlation is significant at the 0.01 level (2-tailed).

Significant correlation exists.

Correlation #6: University education of siblings [Q3] and adequacy of course materials in high school [Q7_4].

Correlations

		Do you have any brothers or sisters who have earned a university degree?	For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.
Do	Pearson Correlation	1	-.112

			.114
you have any brothers or sisters who have earned a university degree?	Sig. (2-tailed) N		
		204	202
For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	Pearson Correlation	-.112	1
	Sig. (2-tailed) N	.114	
		202	202

No significant correlation.

Correlation #7: University education of siblings [Q3] and satisfaction with lab courses [Q13_7].

Correlations

		Do you have any brothers or sisters who have earned a university degree?	For the following statements about your higher education experiences, please select your level of agreement. - I learned a lot of information from lab courses.
Do you have any brothers or sisters who have earned a university degree?	Pearson Correlation	1	-.125
	Sig. (2-tailed)		**.096**
	N	204	178
For the following statements about your higher education experiences, please select your level of agreement. - I learned a lot of information from lab courses.	Pearson Correlation	-.125	1
	Sig. (2-tailed)	.096	
	N	178	178

No significant correlation.

Correlation #8: Desire to stay in the same city as university [Q15] and adequacy of course materials in high school [Q7_4].

Correlations

		Did you stay (or plan to stay) in the same city as your undergraduate university?	For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.
Did you stay (or plan to stay) in the same city as your undergraduate university?	Pearson Correlation	1	-.205[**]
	Sig. (2-tailed)		**.009**
	N	162	160
For the following statements about your family and secondary education, please select your level of agreement. - The course materials (textbooks, lab equipment, etc.) in my secondary school were adequate.	Pearson Correlation	-.205[**]	1
	Sig. (2-tailed)	.009	
	N	160	202

**. Correlation is significant at the 0.01 level (2-tailed).

Significant correlation exists.

Correlation #9: Desire to working outside of Ethiopia [Q18] and perception of learning practical skills in undergraduate major [Q13_6].

Correlations

		Are you interested in working professionally outside of Ethiopia? - Selected Choice	For the following statements about your higher education experiences, please select your level of agreement. - In university lecture courses, I learned practical skills about my discipline.
Are you interested in working professionally outside of Ethiopia? - Selected Choice	Pearson Correlation	1	.135
	Sig. (2-tailed)		**.089**
	N	160	160
For the following statements about your higher education experiences, please select your level of agreement. - In university lecture courses, I learned practical skills about my discipline.	Pearson Correlation	.135	1
	Sig. (2-tailed)	.089	
	N	160	178

Not significant correlation.