BLACK UNDERGRADUATE WOMEN'S SENSE OF BELONGING AS

ENGINEERING MAJORS

by

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(Under the Direction of RICHARD MULLENDORE)

ABSTRACT

The purpose of this interpretive study was to determine how 6 undergraduate

Black women in engineering made meaning of sense of belonging. Using photo

elicitation and interviews, participants described their experiences of community while

studying to be engineers. The data were analyzed using theoretical reading. The women

in the study had several spaces where they felt a sense of community however, the

process of identifying these spaces were not immediate and required participants to

examine the intersections of their identities. The women in the study evaluated and re-

evaluated campus spaces with the question in mind of who will accept me as an

undergraduate Black female engineering. The study concluded that once participants

identified spaces, how they felt in the space was placed on a continuum of belonging.

Implications of the study suggest that programs and services that assist with identity

exploration for undergraduate Black women are essential to their success.

INDEX WORDS: Black women, Undergraduates, Engineering, Sense of belonging,
                 Community, Photo elicitation, and Theoretical reading

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DEDICATION

      This dissertation is dedicated in memory of my maternal grandmother, the late Minnie Pearl Lofton Hopkins for her commitment to my education. Thank you for instilling in me the love of lifelong learning.

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"I can do all things through Christ who gives me strength" Philippians 4:13

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CHAPTER 1

INTRODUCTION

The persistence of undergraduate students remains a concern in science and engineering fields. In a special edition article in the *Chronicle of Higher Education* entitled, *The Gender Gap*, Mangan (2012) draws attention to the continued concerns regarding the disproportionately low representation of women in science, technology, engineering, and mathematics (STEM). The data highlighted in the other articles in the special edition confirms that certain racial/ethnic minorities (i.e., Black/African American[1], Hispanic, and American Indian) are still underrepresented in science and engineering fields. The irony discussed in the report is that women make up the majority (57%) of all undergraduate students in US institutions of higher education, however, only a small proportion pursue and obtain degrees in STEM fields. The National Science Foundation (2009) reported only 17.9 percent of undergraduates majoring in engineering were women. A research and policy paper published by the National Action Council on Minorities in Engineering (NACME), reported that in 2010, only 5% of enrolled engineering students identified as African American. In essence, there is still a concern for how many women and historically underrepresented minorities are not entering in science and engineering fields compared to men.

Though the article raises concerns about the disproportionately low numbers of women and minorities entering into science and engineering, the article also draws

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[1] The terms African American and Black are used interchangeably

attention to the persistence patterns of women in STEM majors. In 2009, the National Science Foundation (NSF) reported that 18.2% of undergraduate students who earned bachelor's degrees in engineering were women. The National Center for Education Statistics (2009) reported that at least 65% of students who enter STEM majors do not complete a degree within six years of entering college. Black and other underrepresented minority students have an even higher rate of non-completion. For instance, less than 16% of Black students who aspire to complete a degree in a STEM field do so within five years (Higher Education Research Institute, 2010). More specifically, the NACME report highlights that though Black women's degree attainment in engineering remains lower than their same race peers, Black women are making strides to equalize their degree completion rate with Black men.

Reasons why women and underrepresented minorities (URMs) are not persisting in science and engineering factors include lack of exposure or interest in STEM majors, academic unpreparedness, and difficulties adjusting to the academic culture (Museus, Palmer, Davis, & Maramba, 2011). While the majority of these factors speak to an individual's background, the circumstances that assist with persistence are constructed programs implemented by individual institutions. For instance, the factors that assist with the persistence of URMs include mentoring, academic support, and outreach programs (Palmer, Davis, & Thompson, 2010) targeted specifically to underrepresented groups on campus. However, few studies have paid attention to the intersection of gender and race/ethnicity and how their experience may be similar to or different from persistence factors affecting other populations of STEM students. For example, the smaller subpopulation of Black undergraduate women in engineering constitutes 1.3 percent of

all enrolled undergraduates in this major. However, researchers know little about the persistence patterns of Black undergraduate females in engineering. Additionally, research examining the role of sense of belonging as a way of understanding persistence is limited. Therefore, the purpose of this study is to explore how sense of belonging as a construct, informs the experiences of Black undergraduate women in engineering.

Background of the Study

My interest in this study is rooted in specific observations from my professional career. First, findings from my recent pilot study (Gibson & Espino, in press) led me to more questions than answers about the experiences of Black undergraduate women in engineering. Secondly, my role as an administrator on a campus with mostly science and engineering majors has sparked my interest about how community is defined by minorities on a campus where few are present and the pressures of competition and individualism permeate the campus culture. Outlined below are detailed descriptions of these two pivotal events.

Pilot Study

The purpose of the basic, interpretive pilot study was to understand how Black undergraduate women in engineering made meaning of Black womanhood (Gibson & Espino, in press). The themes gleaned from this study were (1) dismantling certain identities and stereotypes, (2) accepting identities, (3) defining and redefining Black womanhood, (4) outsider – within status, and (5) role modeling. The findings from the study suggest that a more in depth analysis of the experiences of Black undergraduate women majoring in engineering is necessary.

In summary, findings from the pilot study brought to focus some pivotal points. First, participants acknowledged that they experienced racism and sexism as undergraduate engineering majors. In many instances, the participants spoke candidly about having to prove themselves as capable, worthy members of the campus community. The women in the study described being proactive in developing relationships with all campus community members. They described that they more often than not felt like they had to prove themselves to others on the campus. Black women in the pilot study found solace and affirmation within two groups – family and student organizations created for Black students or women. Many complained that the university offered few places on campus where they could focus on what it means to be a Black woman. Despite the many difficulties they experienced as Black women in engineering, their desire to persevere seemed to be evident. Their motives, intentions and strategies for completing a degree in engineering however, were not explicitly addressed. The conclusions from the study left me pondering more questions than answers. First, how do Black undergraduate women in engineering experience community in their collegiate lives? If community is important to Blacks, women, and college students, how do Black undergraduate women in engineering define community and where are their communities located? If Black undergraduate women are experiencing racism and sexism, where do they find safe spaces and community?

As a housing professional, I have been deeply committed to creating community for students. Though I have not formally measured it in my position, I know that community can positively impact a student's commitment to our campus. Being a part of a community has transformed the experiences of many of my students, helping them to

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feel as though they matter. These communities have constituted various organizations, family, faculty, peers, and staff – making sense of belonging, complex and subjective. It has been my commitment as a student affairs professional to provide places of community for students that compels me to explore how Black women in engineering name community and sense of belonging.

Community played a central role in my collegiate life. As a Black woman, I thought critically about how I experienced community on a campus where it was challenging to find other Black women faculty, students and staff. Therefore, my community became diverse as the need to belong was important to my success at The Ohio State University. My community consisted of individuals who shared similar and diverse values, beliefs, and goals. I know that it was my college community that helped me to learn, develop, and grow as a college student. If a person showed interest in whom I was and what was important to me, they would become a part of my community. Even more important was the need to feel like I belonged. My own strategies have made me wonder how and where other undergraduate Black women have found community and how that community has assisted with their persistence in college. Given the small percentage of African American women in engineering, I wonder, how do Black undergraduate women in engineering describe community? How does being in an environment that values individualism compete with or support their notions of community? What spaces on campus help them feel like they matter? What social support mechanisms are aiding the needs of Black undergraduate women in engineering to feel like a part of a community?

Purpose and Significance of the Study

There are several reasons why a study about the role of community and sense of belonging is important in understanding the experiences of Black women undergraduates in engineering. First, to date, no studies examining community and Black undergraduate women in engineering exist. Various scholars (Hausmann et al., 2007; Strayhorn, 2012; Tinto, 2012) argue that sense of belonging and community contributes positively to the persistence of students of color though they often experience the stress of racism and sexism that could discourage them from wanting to persist. This raises concerns for Black women as they navigate race and gender discrimination because of their position in two marginalized groups. In engineering, the feeling of isolation is magnified as the majority of engineering students are White males leaving higher education professionals with little information about the impact of this discrimination on Black women.

Secondly, the culture of engineering is still described as competitive and individualistic (Foor, Walden, & Trytten, 2007; Hewitt & Seymour, 1997), which is not conducive to the learning styles of all students, nor do we know its impact on one's sense of belonging and community. Tinto (2012) states that community, whether internal or external to the college campus, can aid in the persistence of college students. However, we know little about the role of community and sense of belonging for Black undergraduate women in engineering. Tinto also stresses that the role of sub-communities for students of color remains important to helping them adjust even though being involved in groups related to race do not guarantee persistence. Therefore, what constitutes sub-communities for Black undergraduate women in an environment that consists primarily of White men has not been explored nor has their involvement in race

or gender specific organizations been considered. This leaves ample opportunity to explore students' sense of belonging and communities for Black undergraduate women in engineering.

While no studies specifically address community and Black undergraduate women in engineering, two quantitative studies have made strides in the direction of exploring sense of belonging for this population. For example, Black undergraduate women in engineering reported declines in feeling a sense of belonging while studying to be engineers (Marra et al., 2012). In another study, Black women's sense of belonging is described as being lower than their same race peers (Strayhorn, 2012). The implications of both studies suggest that further exploration about how sense of belonging and community are experienced by Black women in engineering is important to consider.

In summary, there is a deficit in Black students completing degrees in engineering (Frehill, Di Fabio, & Hill, 2008). In turn, Black students are needed to help fill the gap of engineering professionals for the United States to stay globally competitive in STEM fields. Next, research on women or students of color does not capture the experiences of Black women because it does not account for the intersections of race and gender identities (Tate & Linn, 2005). Because of Black women's unique social location and the importance of student's sense of belonging on campus, their experiences are important to explore. Therefore, the purpose of this interpretive study is to explore, while using the theoretical framework of Black feminist thought, how 6-8 undergraduate Black women make meaning of sense of belonging and community while studying to be engineers. This enhanced understanding would contribute to our knowledge of what it means to be a Black undergraduate woman in engineering.

Research Questions

1. How do Black undergraduate women in engineering make meaning of sense of belonging and community?

2. How do the values of competition and individualism influence how Black undergraduate women perceive sense of belonging as engineering students?

3. How do Black undergraduate women navigate and negotiate community while studying engineering?

4. How is the intersection of race and gender represented in Black women's experiences of belongingness in an engineering culture?

Definition of Terms

1. STEM is an acronym for science, technology, engineering, and mathematics (NSF)

2. 'Double bind'- refers to the racism and sexism women of color simultaneously experience in the science, technology, and mathematic fields

3. URMs – underrepresented racial minorities in STEM include African American/Black, Hispanic, and Native Americans

Organization of the Study

Chapter one has provided an overview of the purpose and the importance of this study to higher education. The second chapter provides an overview of the relevant literature and the theoretical perspectives that will inform the study. The third chapter in describes the methodology and methods that will be used to answer the research questions. Chapter four provides a description of the results while chapter five provides

an analysis of the findings. Chapter five concludes with recommendations for practice

and further research.

CHAPTER 2

REVIEW OF THE LITERATURE

The literature review will cover relevant information that supports the purpose of this study. The sections are divided into persistence, sense of belonging's relationship to persistence, women of color in STEM and Black women in higher education. The chapter concludes with an overview of the three theories that will guide this project.

In 2005, Terenzini and Reason, argued that student persistence should be considered in the context of several parts including student pre-college characteristics and experiences, organizational context, and peer environment. However, in its most simplistic definition, Tinto (2012) defines persistence as the duration of two year and four year degree completion, with a focus on obtaining a degree. Given that all components are important in understanding the complexities of degree completion, research studies vary on which section of persistence to focus on for their research.

Models to describe persistence in science and engineering have been described as pipelines, paths, and circuits. Each model has attempted to metaphorically capture the journey students' take to degree completion in science and engineering majors. Two, often referenced studies, exist that drew attention to the complexity of persistence in science and engineering education. Published in 1997, Seymour and Hewitt, ask the complex question of why are so many students leaving science, technology, engineering, and mathematics majors. Their extensive work highlights the complexity of the road to persistence in STEM education. They argue that STEM research should focus on academic and non-academic factors that impact persistence. Academic factors that impact

persistence in science and engineering focus on curriculum, teaching, and advising while non- academic factors include belongingness and peer interaction. As highlighted in this work, some non-academic factors that were unique to students of color included incongruence in cultural values, isolation, and racism. The second often, referenced study is a monograph written by Adelman (1998), which also addressed persistence rates among women and men. Considering various factors from pre-college major choice to enrollment in major courses, Adelman attempted to simplify the complex path to degree completion. The study brought to focus when a student concludes their tenure in science and engineering majors. The findings affirm that students decide to change majors before and during the time in which they are taking major specific courses. The author of the study suggests that non-completion may be due to perceptions of engineering as a field. These two studies serve as exemplars for demonstrating the nuisance of persistence factors that contribute to student's degree completion. As noted by Reason (2009), persistence and retention research is complex and often misunderstood. Persistence in STEM education is no exception.

Early studies suggest that women in engineering have persisted at much lower rates than their male peers. However, a more recent study purports that all women, regardless of race, persist at comparable rates to men (Lord, Camacho, Layton, Long, Ohland & Wasburn, 2009). Contrary to previous studies that report women fare poorly in engineering, the data indicate that women persist in engineering at approximately the same rates as men, even when disaggregated by race. And, when women leave engineering, they are changing majors, not leaving the institution. Findings from the Marra, Rodgers, Chen, and Bogue (2012) study offer two major explanations for why

students leave engineering. First, both academic and non-academic factors contribute to a student's decision to leave engineering and secondly, non-academic factors such as a lack of belonging, have a greater influence than academic factors on the decision for a student to leave engineering. These studies affirm that understanding persistence in science and engineering education is complex and the use of a variety of perspectives lends itself to a richer understanding of student persistence in these majors.

Sense of belonging's relationship to persistence

Various scholars have described community and sense of belonging (e.g. McMillan & Chavis, 1986; Osterman, 2000). Many definitions of community have been offered over the years to assist higher education professionals in understanding the components necessary to promote persistence. In certain instances community and sense of belonging are used interchangeably to describe an ideal environment a student should experience on a college campus. One of the most notable definitions of community in higher education was outlined in the Carnegie Foundation for the Advancement of Teaching, *Campus Life: In Search of Community*. In the report, Boyer (1990) outlines six principles that every college and university should ascribe to in order to create community on their campus. The six principles are:

1. A college or university is an educationally *purposeful community*, a place where faculty and students share academic goals and work together to strengthen teaching and learning on the campus

2. A college or university is an *open community*, a place where freedom of expression is uncompromisingly protected and where civility is powerfully affirmed

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3. A college or university is a *just community*, a place where the sacredness of each person is honored and where diversity is aggressively pursued

4. A college or university is a *disciplined community*, a place where individuals accept their obligations to the group and where well defined governance procedures guide behavior for the common good

5. A college or university is a *caring community*, a place where the well being of each member is sensitively supported and where service to others is encouraged

6. A college or university is a *celebrative community*, one in which the heritage of the institution is remembered and where rituals affirming both tradition and change are widely shared (pp. 7 - 8).

Boyer argues that these six principles when used in conjunction with one another, creates the type of community a student should expect at a university. With emphasis on the community principles, Boyer believes "by bringing together the separate parts, [institutions] create something greater than the sum, and offer the prospect that the channels of our common life will be renewed and deepened" (p. 63). This type of expectancy for a community leaves the institution with a responsibility to create an inclusive environment for all of its members. Though colleges and universities have attempted to create campuses that meet these six principles, many college students continue to feel marginalized while in college.

Community and sense of belonging play a critical role in the college student experience. For many students, community may be the factor that helps them to persist to graduation. For example, Strange and Banning (2001) argue that community consists of

various components – feeling a sense of community, security, and engagement. "Communities establish a status of full membership for participants in an environment, offering them opportunities to engage over time in a distinct history, tradition, and culture" (Strange & Banning, 2001, p. 161). The definition offered in this discussion draws attention to two assumptions about community that are important to this study. First, once community is established, there is an assumption that one has gained full membership into the environment. Strange and Banning's (2001) other implication is that once membership is established, one will feel comfortable participating in the community. Both assumptions glean important considerations related to the role of belongingness and membership in a community. However, these assumptions, in many ways, run contrary to the experiences of Black undergraduate women in science and engineering education.

As mentioned above, varying definitions exist for community however; Black feminist theorists argue that more prominent definitions of community are based in Eurocentric worldviews.

> Black women's experiences and the Afrocentric feminist thought
> rearticulating them also challenge prevailing definitions of community.
> Black women's actions in the struggle for group survival suggest a vision
> of community that stands in opposition to that extant in the dominant
> culture. In contrast, Afrocentric models of community stress connections,
> caring, and personal accountability. (Collins, 1990, p. 554)

Communities for Black women are a place to re-conceptualize notions of power. Collins (2000) continues by arguing that some communities have served as safe spaces for Black

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women in various contexts while also providing a place for Black women to feel empowered and develop strategies of resistance. Therefore, the Eurocentric worldviews of community may not take into account the role communities play in providing a sense of belonging or safe space for Black women. This is especially important because Black women students are often confronted with a college environment that does not espouse inclusivity. This often leaves Black students in a place that seems to be uninviting or hostile at times. For Black women specifically, experiences of racism and sexism are prevalent during their college years at a predominately white university (Howard Hamilton, 2003; Winkle Wagner, 2009). For African American women students' sense of belonging and community remain a vital part of their college experience even though they often experience it in the margins (Bonner, 2010) however, the conceptualization of community for Black female students is vague. Therefore, it is important to consider frameworks that take into account the experiences of belongingness and community for women of color.

Women of Color in STEM

Prior to the publishing of the *Double Bind* report, it is difficult to pinpoint when studies concerning the persistence of women of color in STEM fields began. Defined as the 'double bind,' women of color in science and engineering fields were given this label because of the race and gender discrimination experienced while being engineers and scientists.

Researchers bringing attention to how women of color experience science and engineering education are not new. In 1975, thirty scientists convened to discuss the issues that impact women of color in science and engineering. From this conference came

the report, *The Double Bind: The Price of Being a Minority Woman in Science.* The report provided feedback on policy and practices institutions could implement to assist with the recruitment and retention of women of color in science and engineering fields. Information presented in the document outlines the collective voices of individuals who were concerned about the future of women of color in science and technology.

Over 35 years later, another report was published entitled *Inside the Double Bind: A synthesis of empirical research on undergraduate and graduate women in STEM* (Ong, Wright, Espinosa, & Orfield, 2011). The report provided a meta-analysis of research about women of color in STEM fields however with a national decline in students interested in science and engineering; the authors argue that women of color remain a vital resource in helping to close the engineering workforce gap in the United States. Though many strides have been made to aid in the retention and recruitment of women of color, the authors note that this population remains an untapped resource (Ong, et al., 2011). The report outlines two major conclusions - (1) since the 1970's, research about women of color in STEM fields remains limited and (2) current STEM programs support women or racial/ethnic minorities not the combination of both.

Women of color experience racism and sexism while studying to be engineers and scientists (Justin - Johnson, 2007; Ong, 2002). A few studies, for example, have affirmed that women of color in STEM majors experience isolation because science and engineering environments often privilege White men and leave women of color in the margins (Johnson, 2012; Seymour & Hewitt, 1997). For instance, Tate and Linn (2005) reported that "feelings of difference in an environment can cause students to lack a sense of belonging. Some students find difficulty in forming and participating in study groups

because of their racial and ethnic difference" (p.488). Along those same lines, women of color continue to feel as though they have to prove themselves as engineers and scientists (Carlone & Johnson, 2007).

A supportive college environment assists with the persistence of students of color in science and engineering education (Bonous-Hammarth, 2000). However, what constitutes a supportive environment has been contested for women of color in STEM fields. For example, support for students of color takes on various forms including role models, peer-to-peer knowledge sharing, and relationships with staff members of color. Though these support mechanisms are important, little is still known about how they contribute to the student's sense of belonging or community.

In summary, research outlining the experiences of women of color in science and engineering has provided scholars and practitioners some additional insight into what it means to be a part of the 'double bind' in STEM education. The current research affirms the importance considering the convergence of race and gender in the experiences of women of color in engineering.

Black Women in Higher Education

The lived experiences of Black women are understated and often misunderstood. Research focusing on the experiences of Black women in higher education has been limited (Howard Hamilton, 2003; Robinson & Franklin, 2011). For good reason, research focusing on Black/African American students has primarily been dominated by studies about African American males however; this focus has led to several scholars creating research agendas that focus on Black women in higher education. The past few years have garnered an increase in scholarship predicting and describing the experiences of

Black undergraduate females has grown. For instance, monographs and books have been dedicated to the exploration of the experiences of Black college women (e.g., Banks, 2009; Howard-Hamilton, 2003; Winkle-Wagner, 2009). Though the majority of Black students on campus are women, the literature explaining their day-to-day experiences is limited. For example, over the past decade, an increase in higher education participation by Black women has occurred. The National Center for Education Statistics (2010) reports an increase of 67% in the number of Black women participating in higher education from 1998 to 2008.

Black women face multifaceted challenges that transcend all areas of their lives. Faculty and administrators know little about the day-to-day experiences of Black women students in college (Robinson & Franklin, 2011). Black women are in a unique position because they experience both racism and sexism in their everyday lives (hooks, 1994). As noted by Collins (2000), Black women are placed in a distinctive social location because of their race and gender statuses however; their experiences are placed in the margins of society. Gold (2011) states "Black female students are always mentally, educationally, or emotionally situated to climb from one ill-suited role to another less than ideal role, rather than being true to oneself by espousing one's rightful, value added characteristics" (p. 62). Though Black women experience both racism and sexism, Black feminists, such as hooks and Collins argue that resiliency has been a survival tool for African American women.

The undeniable fact is that higher education professionals still know little about the factors that contribute to the persistence of Black women in engineering (Bonner, 2010; Johnson, 2012). Black women are identified in science, technology, engineering,

and mathematics (STEM) fields as an underrepresented minority. Individuals in both their race and gender categories have consistently remained a disproportionately small population in the STEM fields. Studies have been conducted about women, Blacks/African Americans, or women of color in STEM fields, leaving ample opportunities to research how intersections of these populations persist in these academic disciplines (Lord, Camacho, Layton, Long, Ohland, & Wasburn, 2009). Though efforts have been made to extend the discourse about aspects that assist with persistence for women and students of color in science, technology, engineering and mathematic majors, few studies exist that focus on subpopulations in these fields (e.g., Hanson, 2004; Hanson, 2006).

As described by Collins (2000), researching various experiences of Black women remains important because of their subordinate race and gender identities. Collins also argues that because Black women are often experiencing their lives in the margins of society, it is important to put their experiences in the forefront of research agendas because of their unique lived experiences.

Theoretical Perspectives

Three theories have been selected to inform the study. This section will provide an overview of the theories – Collins' Black feminist thought, Omi and Winant's theory of racial formation, and Strayhorn's model of student's sense of belonging. In this section each theory will be summarized followed by the rationale for its use in in this study.

Critical Social Theory

In this section, I will review the critical social theory I have selected and the utility it has for this study. The theoretical framework for this study is Black feminist

thought (BFT). Before outlining the features of BFT, I will review the theoretical

framework where BFT resides – critical social theory. Below an overview of black

feminist thought will be discussed, followed by the rationale of its use in this study.

Described as a nontraditional discipline, critical social theory (CST) is

interdisciplinary. Various scholars have articulated functions of CST however; those that

apply directly to Black feminist thought will be explored in this section. In the context of

Black feminist thought, certain functions related to critical social theory are important to

consider. First, critical social theory is "a multidisciplinary framework with the implicit

goal of advancing the emancipatory function of knowledge" (Leonardo, 2004, p. 11).

Additionally, the role of CST is to raise awareness of oppression in the everyday lives of

individuals (Agger, 1998). One of the most enduring functions of critical social theory is

its rejection of positivism. Meaning, the social world is not objective and theorists

necessarily construct knowledge and intentionally make assumptions about the world

around them. CST stresses the importance of recognizing the past and believing that the

present can be a lived experience void of oppression and domination. CST is political in

that it supports social change that will eradicate oppression experienced by certain

groups. Critical social theorists argue that change begins in the everyday lives of

individuals Agger, 1998; Leonardo, 2004).

Collins (2000) argues that Black Feminist Thought (BFT) is US Black women's

critical social theory. Committed to justice for Black women and other oppressed groups,

Collins articulates that BFT is a critical social theory for several reasons. First, the

knowledge acquired through the lived experiences related to the intersection of race,

class, and gender oppression provides "the stimulus for crafting and passing on the

subjugated knowledge of Black women's critical social theory" (p. 11). In other words, because of the intersection of historically oppressed identities, Black women construct unique ways to navigate their home, work, and community environments. Because of BFT's description as a social theory, the theory is committed to "coming to terms with lived experiences within intersecting oppressions" (p. 12). The need to consider the intersection of oppressed identities such as being Black and female are undeniably important in considering their lived experiences.

Black Feminist Thought. Described as both a standpoint and critical social theory, Black feminist thought has several features that are both diverse and contradictory (Collins, 1990). Collins (1997) notes "Black feminist thought consists of specialized knowledge created by African American women which clarifies a standpoint of and for Black women" (p. 243). Collins' goal in writing Black feminist thought was to place the experiences of Black women in the center of analysis. She argues that most theories and epistemologies were not designed to capture the experiences of Black women. In her earlier writings, Collins (1990) states "Black feminist thought demonstrates Black women's emerging power as agents of knowledge" (p. 221). Her work describes two goals for Black feminist thought – self-definition and self-determination. Self-definition means to "name one's own reality" (Collins, 1998, p.45) while the other goal is self-determination – the power to decide one's future. She argues that BFT has distinguishing features that are used to understand subjugated knowledge created by Black women.

Black feminist thought (BFT) has been selected for several reasons. First, BFT was designed to place the experiences of Black women in the center of analysis. Collins (1990) argues that by focusing on Black women, individuals are able to consider how the

intersection of oppressive identities plays out in the everyday lives of this group. As acknowledged by Collins (1989, 1990), Black women's lives provide a paradigm shift in how researchers consider the intersections of race, gender and class. Black feminist thought stresses that no oppression is greater than another but that oppressions such as race, class, and gender, intersect creating unique social experiences for Black women and other historically oppressed groups. Described in her work as the matrix of domination, Collins cautions researchers to move away from the additive model of oppression identities and seek knowledge about how varying identities interlock with one another to create new paradigms. She argues that BFT provides a unique standpoint because of its focus on a group that resides in two historically oppressed groups – women and Blacks.

Another distinguishing feature is the idea that Black women face common challenges but, Black women are diverse in how they respond to racism and sexism in their everyday lives. In other words, it is not appropriate to essentialize the experiences of Black women in the US. Though experiences are different, Collins argues that Black women find solace and support from one another, further affirming the need for relationships and community. Within Black women's relationships comes the knowledge and resources to make changes that are dynamic. Black feminist thought stresses the importance of addressing current issues that impact the lives of Black women and other oppressed groups.

In the higher education literature, the use of Black feminist thought as a theoretical perspective has emerged. Scholars such as Howard Hamilton and Winkle Wagner have used BFT to interrogate the experiences of Black women in higher education. Their work brings focus to the complexity of identity development for Black

women as they negotiate what it means to be members of two historically oppressed groups. The use of Black feminist thought will be particularly useful for this study, as it will bring focus to the convergence of race and gender for Black women in an academic field where their presence is small.

Racial Formation. Omi and Winant's (1994) theory of racial formation provides a framework that will be useful in this study. Grounded in the question of what is race, Omi and Winant describe race as being socially constructed. Omi and Winant (1994) argue that racial formation is "the process by which social, economic and political forces determine the content and importance of racial categories, and by which they are in turn shaped by racial meanings" (p.10). Filled with contradictions and uncertainties, the concept of race has historically been a way to categorize individuals and produce social structures that are oppressive. Race shapes how one perceives both micro and macro level interactions with institutions and individuals. Omi and Winant define the theory of racial formation as, "the socio-historical process by which categories are created, inhabited, transformed, and destroyed" (Omi & Winant, 1994, p. 55).

This framework brings into focus the role of both social structures and cultural representation. In reference to social structures, which represent a more macro-level perspective, it is argued that race influences policies and practices in institutions. At the micro-level, Omi and Winant explain it as the way one "unconsciously" ascribes racialized meanings to everyday life. These become the stereotypes and pre-conceived notions one expects for how race is performed in individuals day to day lives. " Our ability to interpret racial meanings depends on preconceived notions of a racialized social structure" (Omi & Winant, 1994, p. 59). In other words, race is everywhere and it

impacts the expectations one has for members of institutions. The implications of racial

formation suggest that race operates on the individual, micro level also known as

individual identity and the larger, macro level which is the collective social structures.

"Racial formation, therefore, is a kind of synthesis, an outcome of the interaction of racial

projects on a society wide level (Omi & Winant, 1994, p. 60).

To date, no studies using racial formation theory in higher education could be

located. It is through this project, that racial formation will extend the discussion of the

role of race in understanding both college students and institutional policies and practices

in higher education. Thus, the application of racial formation theory for this study is

useful for considering how race is both historically and socially located in social

structures including higher education. In the case of this study, it will be important to

consider who has historically been welcomed into this space and how certain social

structures reinforce cultural norms and practices that may not be welcoming to all

students.

College Student's Sense of Belonging. More recently in the higher education literature,

a model describing college students' sense of belonging was developed and its utility for

this study is appropriate. Grounded in research studies about students of color and other

marginalized groups, Strayhorn's (2012) model of college student's sense of belonging

focuses on the heightened awareness of inclusivity or exclusion. His operational

definition is the following:

> Sense of belonging refers to students' perceived social support on campus,
>
> a feeling or sensation of connectedness, the experience of mattering or

feeling cared about, accepted, respected, valued by, and important to the

group or others on campus. (Strayhorn, 2012, p. 17)

The model consists of seven core elements that comprise sense of belonging. The first

element suggests that sense of belonging is a basic human need that continually needs to

be met throughout the course of one's life. Strayhorn states that sense of belonging takes

on what he describes as a heightened awareness in college. Because many students are

entering into a new environment, they are urgently seeking connection to others. Careful

to describe isolation as a cousin to sense of belonging, the model places emphasis on the

importance of belongingness in their overall wellness and intentions to persist. The

second tenant emphasizes the need to belong as, "a fundamental motive, sufficient to

drive human behavior" (p.19). The need to belong produces behavior that can result in

either positive or negative outcomes. Meaning, the desire to belong is motivation enough

to impact one's behavior in order to have this need met. For some students, this may

mean becoming a campus leader, while for others this might be partaking in illegal

behavior. Third, sense of belonging becomes especially important based on the context,

time, and among certain populations, especially those marginalized groups. "Belonging

may also offer a shared sense of socially constructed meaning that provides a sense of

security or relatedness" (p.20). In the next tenant, Strayhorn emphasizes that student's

desire to be in an environment where student's feel accepted and valued by others during

their college years should not be underestimated. In other words, sense of belonging is

related to and a consequence of student's sense of mattering. To matter means to feel like

you are important to someone else and they are concerned with your future (Schlossberg,

1989).

The fifth element suggests that when social identities intersect with each other, they impact how a student experiences belongingness. The convergence of multiple social identities plays an important role in how one makes meaning of their experiences of belonging or isolation. Strayhorn argues that one should consider identity and identity salience when studying sense of belonging. It is their identities that inform how they place meaning on the environment around them. Element six affirms that sense of belonging has several positive outcomes on the college experiences including but not limited to intentions to persist, achievement, and happiness. The goal is that students will feel so connected that not being connected to others will be an unacceptable practice in their college environment. And the final element stresses that sense of belonging must be satisfied on an ongoing basis even though the environment will change. When sense of belonging is not present, it runs the risk of creating an environment that students feel lonely, and disengaged in their educational pursuits.

In conclusion, the use of the student's sense of belonging model is to ground this study in a student development model that acknowledges sense of belonging as a precursor to community and that the both parts must work together. Strayhorn (2012) argues that in the context of college, sense of belonging and other basic human needs are important and connected to one another. The model places emphasis on social spaces and contexts which drive how student navigate and negotiate their college experience. He argues that these spaces are where experiences of belonging and community are discovered.

In conclusion, chapter two has provided an overview of the relevant literature and theories that will be used to for this study. The section serves as the foundation for

understanding the need to explore sense of belonging for undergraduate Black women in engineering. The theories outline the perspectives that guide the study.

CHAPTER 3

METHODOLOGY

This chapter will discuss the methodology and research design I employed for this study. The following sections are covered in this chapter: research design, participants, data collection and analysis, trustworthiness, ethical considerations, and limitations.

The purpose of this interpretive study was to explore, while using the theoretical framework of Black feminist thought, how 6-8 undergraduate Black women make meaning of sense of belonging and community while studying to be engineers. The following research questions guided this study:

1. How do Black undergraduate women in engineering make meaning of sense of belonging and community?

2. How do the values of competition and individualism influence how Black undergraduate women perceive sense of belonging as engineering students?

3. How do Black undergraduate women navigate and negotiate community while studying engineering?

4. How is the intersection of race and gender represented in Black women's experiences of belongingness in an engineering culture?

Research Design

When selecting a research methodology, it is important to consider its theoretical underpinning because it needs to align with the researcher's purpose for the study

(Glesne, 1999). Therefore, qualitative research was selected because it seeks to understand the meaning that is placed on a phenomenon (Bogdan & Biklen, 2007).

Merriam (2009) offers four common characteristics of qualitative research that align with the design of the study. First, qualitative research is rooted in philosophies such as symbolic interactionism and constructivism that seek to understand how individuals make meaning of their lives. The second characteristic is the researcher is the primary instrument. According to Merriam (2009), "the researcher is the primary instrument for data collection and analysis" (p. 15). When the researcher is the instrument, the information can be immediately adaptive and responsive. Third, the qualitative process is inductive. "Researchers gather data to build concepts, hypotheses, or theories rather than deductively testing hypotheses…" (p.15). The final characteristic Merriam offers is that of thick, rich description. "Words and pictures rather than numbers are used to convey what the researcher has learned about the phenomenon" (Merriam, 2009, p.16). Quotes and visual representation such as photos are used to explain the phenomenon under investigation. Merriam's (2009) common characteristics offer components that frame the foundation of this study.

Participants

Participants for this study were selected using purposeful sampling. The sample selection criteria for this study were as follows: (1) Black/African American, (2) female, (3) undergraduate college student, who is (4) majoring in engineering. The participants provided data for my research questions because the study is focused on the undergraduate college experiences of Black women in engineering. Six participants worked with me in my study. Participants completed at least one year of college to be

eligible for the study. At least one year at college allowed for the participants to draw on their experiences of sense of belonging and community while on campus.

The participants from the study included six self-identified undergraduate Black women who currently major in engineering. The women were eager to participate in the study. During the interviews, each woman had agreed to participate because they were eager to tell their stories. Their inquisitive nature was evident during our first interaction as each of them asked several questions about the motivation of the study. Once the motivation for the study was understood, the women would begin discussing their experience on campus. As we continued our conversation, we shared laughs, tears, and moments of reflection that filled the interview with some very heartfelt experiences. Their responses were filled with passion, pain, and frustration as they reflected on what it meant to be a Black woman in engineering. It was during their interviews I felt their sense of urgency in sharing their stories. Each participant willingly participated in all components of the study. Their willingness to meet with me during various times of the day including 7am or 10pm, confirmed for me their commitment to our study. All six participants were enrolled at the same institution during the time of the study however some had transferred from historically Black colleges and universities. A brief overview of each participant will be explained below:

Angela – Angela identifies as a Black woman from the northeast. She has studied at the institution since her freshman year. She has been active in a variety of student organizations and sees this as a way to give back to the community. Her involvement on campus provided ample examples for how she constructed the world around her. She is also a highly respected campus leader and spent most of her out of classroom time

advocating for issues concerning students of color. At the time of the study, Angela was in her fourth year at the institution.

Frances – Frances is a transfer student from a historically Black college in the southeast. She is a graduating senior at the time of this study. She has always been interested in construction and design and chose civil engineering in order to have the flexibility to design a host of objects including buildings, bridges, and transportation. She has only been involved in a statewide initiative that is designed to assist with the retention of students of color in science, technology, engineering, and mathematics.

Kayla – Kayla, a quiet, reserved woman was a transfer student from a historically Black college in the southeast. At the time of the study, she was beginning her second year on campus. Her primary involvement is in a Christian student organization. Kayla mostly spent time with a small group of friends on campus. She attributes this to her need to focus on her academics so that she can graduate from the institution.

Mara – Mara is a transfer student from a historically Black college in the southeast. At the time of this study, she was beginning her second year at the predominately white university. Mara identifies as a Muslim student. Mara was also heavily involved in student organizations that were concerned about the advocacy of Black students on campus. She often compared her experiences of being at a historically Black college to her current experience.

Rebecca – Rebecca is a graduating senior who began her career at the institution. She was raised only 20 miles from the college. She is actively involved in minority recruitment events and other activities for Black students. She self describes as a talkative, outgoing student that is not afraid to share her opinions about her experiences.

She has held several student organization positions in order to remain active and visible with Black student issues on campus.

Sophia – Sophia was raised in the rural southeast and has been on campus for only one year. She has been active with the radio station, housing, and a student organization for African students. Sophia describes herself as someone that can get along with anyone. She consistently demonstrates compassion for the students and staff she has worked with on campus because she believes that she will be treated fairly by others.

Table 1: Participants' Demographic Information

Pseudonym	Class Standing	Major	Transfer Student
Mara	Senior (5th)	Chemical Engineering	Yes, Historically Black College
Angela	Senior, (5th)	Environmental Engineering	No
Frances	Senior (5th)	Civil Engineering/Business Management	Yes, Historically Black College
Sophia	Sophomore	Biomedical Engineering	No
Rebecca	Senior (5th)	Biomedical Engineering	No
Kayla	Junior	Computer Engineering	Yes, Historically Black College

Site of Research. Participants from this study were recruited from a midsized institution in the southeast, Engineering University (pseudonym). This site was selected for its prestigious engineering program and its dedication to graduating Black students. Engineering University (EU) was founded in the late 1800s. The first woman was admitted to Engineering University in the early 1950's and the first African American would be admitted in the early 1960's. The university prides itself in being the first university in the South to integrate without a court order. Currently, EU has

approximately 21,000 undergraduate and graduate students. According to *US News and World Report*, EU has consistently been ranked in the top ten public universities in the United States. Located in a large, urban city in the southeast, the university is credited with being one of the top producers of African American/ Black undergraduate engineers in the country. According to the publication, *Diverse: Issues in Higher Education*, the university is ranked in the top 5 in graduating African American undergraduate students. In fall 2012, 6.63% of undergraduates identified as Black/African American making up less than 1,000 students on campus. According to EU's website, 27 Black/African American women graduated with a bachelor's degree – equaling 1.6% of all engineers who graduated in 2012.

I recruited participants with the assistance of the Director of Outreach programs for the College of Engineering. The director has access to the names and email addresses of all engineering students on campus and specifically possible participants for my study. I asked the director to only email participants who met the selection criteria for this study using a solicitation email (see Appendix A). In the email, I requested potential participants to email the primary researcher to acknowledge interest.

All interested participants attended a pre-interview meeting. The purpose of this meeting was for each participant to learn about the study, sign a consent form, and receive the camera they will need in order to participate in the study. During this meeting, the researcher answered any questions participants had regarding the purpose of the study.

Data Collection

I used two forms of data collection for the study. The primary source of data collection was through one on one interviews. The purpose of using one on one interviews was to explore how each participant made meaning of sense of belonging and community as engineering majors. As noted by Roulston (2010) "ethnographic interviewing is to explore the meanings that people ascribe to actions and events in their cultural worlds, expressed in their own language" (p. 19). As highlighted in earlier sections, how the participants conceptualize student's sense of belonging and community were the foci of this study. After participants agreed to be a part of the study by signing a consent form, I asked semi-structured, open-ended questions from my interview protocol guide (Appendix B). I followed questions with probes to assist in garnering additional information from participants. I interviewed each participant for 45 – 90 minutes in a mutually agreed upon location.

During the interview, I employed photo elicitation as the second form of data collection. "Photo elicitation is based on the simple idea of inserting a photograph into a research interview" (Harper, 2002, p. 13). Photo elicitation was useful in gathering information about the physical spaces where participants felt a sense of belonging or community. Additionally, photo elicitation assists participants with articulating the social and cultural norms one may experience in their day-to-day lives (Harper, 2002). Each participant was asked to bring the pictures they took with the camera they were provided at the pre-interview meeting. During the interview, the participant explained the significance of the objects in the picture. The goal of this photo elicitation project was to garner information about the physical spaces where the participant feels a sense of

belonging and community. During each interview I audiotaped and took notes of the interview. After each interview, the audio recording was transcribed.

During each interview, the women shared various emotions about their time as a student. It was evident during our time together that each participant was eager to share her experiences. Though they were interested in the study, the participants seemed to be more interested in sharing their stories. A few of the women mentioned that this was the first time that someone inquired about their sense of community on campus. And that alone, was motivation for them to continue with assisting me with the project.

Data Analysis

The interview analysis for this study was theoretical reading. Kvale and Brinkmann (2009) define theoretical reading as, "a theoretically informed reading of interviews" (p. 235). The goal of this method is to reflect theoretically on the interviews and to write interpretations informed by theory. Reflecting on the work of Patti Lather, Kvale and Brinkmann suggests that theoretical reading " reject(s) any simple analytical frame, [the] goal is to proliferate, juxtapose, and create disjunctions among different ways of reading, working toward a multilayered data analysis" (p. 236). In other words, the purpose of using theoretical reading is to "think with theory" (Jackson & Mazzei, 2012). As noted by St. Pierre and Jackson (in press) "there is no recipe for this kind of analysis" therefore below I describe my executed plan for the study.

The goal of using theoretical reading as analysis is to interpret data using various theories, with the desire that each theory will highlight different aspects of the phenomena, sense of belonging and community, under investigation. Theories I used to begin the interpretation of the data were, Black feminist thought, racial formation, and

student's sense of belonging. As part of the analysis process, I read and re-read these and others' theories to help inform the analysis "because one has to first read and study theory carefully and then put it to work…" (St. Pierre & Jackson, in press). Additionally, I read through the interview transcripts, annotated and made notes within the text. This process was informed by analytical questions derived by theories and concepts I have selected to use for this study (Jackson & Mazzei, 2012). Additionally, I employed memo writing throughout the process. I wrote memos at the end of each interview in order to capture my immediate reaction to the interviews. I later reviewed the memos and added additional thoughts about how it connected with other theories and concepts. The information was organized into a word document that helped me manage the data and its connection to theory. I used the research questions as the basis for how the data was organized in the document. Each participant response was reviewed and identified as answering one or more of the research questions. Once the information was organized, I reviewed the data from each questions and developed connections across the text. I then used the research questions as the framework for developing the analysis section.

Trustworthiness

In qualitative research, certain strategies are employed to validate the rigor of a study. Trustworthiness is determined through the implementation of techniques related to validity and reliability (Merriam, 2009). The techniques selected for this study are discussed.

Credibility and dependability refer to the question of internal validity. In other words, are the research findings believable and trustworthy (Merriam, 2009; Roulston, 2010). The two strategies that were employed for credibility were member checking and

triangulation. Member checking is an opportunity for interviewees to reflect on and provide feedback about the findings of the study (Merriam, 2009). The hope is that interviewees will provide insight into whether or not their experiences are reflected in the preliminary findings. I will solicit feedback throughout the analysis process. The other strategy is theoretical triangulation, which is described as the process when the researcher uses multiple methods, sources, and theories to determine credibility. Roulston (2010) describes theoretical triangulation as, "different theoretical perspectives of the data are compared" (p. 84). For the sake of this study, I employed the use of multiple theories. As noted in the data analysis section, I used Black feminist thought, racial formation, and student's sense of belonging to analyze the interview data from this study.

The dependability of this study was strengthened using peer examination and audit trail. As noted by Merriam (2009) peer review is an opportunity to discuss with colleagues the process, findings, and interpretation of the study. Specifically, two peers reviewed the study and provide input. I solicited peers who are knowledgeable in the areas of engineering education. Also, I maintained an audit trail that outlined the documents, transcripts, and any additional sources I used for the study. More specifically, I kept a record of the nuances of how of I implemented the study.

Ethical Considerations

It is important to outline the ethical considerations within any study. Outlining the ethical considerations for a study explains how the researcher intends to guard participants and protect them from harm (Torres, Jones, & Arminio, 2006). Before the interview began, each participant received a consent form (Appendix C) that outlined the purpose of study. Participants signed the consent form if they were interested in

participating in the study. Bogdan and Biklen (2007) stressed that confidentiality is important to consider when conducting qualitative research. As the researcher, it was my responsibility to ensure that the identifiable information such as names, provided by the participants was not shared with others. I exercised confidentiality by assigning pseudonyms to each participant. As suggested by Bogdan and Biklen, I also requested that the pictures the participants provided as part of the study, did not include any physical bodies. Tapes, transcriptions, photos and notes were stored and locked in my home office and will be destroyed at the end of the study. Participants' actual names are not disclosed in the final report.

Limitations

In research studies it is important to consider the limitations of the study. The major limitation of the study includes the focus on such a specific population – Black women in engineering. The participants solicited for this study made up a very specific population in only one STEM major. Therefore, the findings of the study cannot be, nor should they be generalized to other students of color in any science, technology, engineering or mathematics field.

CHAPTER 4

FINDINGS

Student development theorists have relied on person environment theories to examine how the environment impacts the lives of students on campus. As result, the responses to these research questions play an important role in understanding how individuals, in this case, undergraduate Black women, interact with the environment – engineering culture. To explore sense of belonging and community for undergraduate Black women in engineering, participants used photos and one-on-one interviews to describe their experiences while studying to be engineers. First, each participant met with the researcher to learn about the study and was provided a consent form and instructions on how to take part in the research project. During this first meeting, the participant spent approximately 30 minutes asking questions about the study, providing information about themselves, and discussing why this study is important to them. At this meeting, participants received a camera and instructions for completing the photo elicitation section of the study. The instructions asked participants to take pictures of places on campus where you feel a sense of community or belonging. Each participant was encouraged to take as few or as many pictures as they would like. They were also asked to avoid taking pictures of anyone's face. During our second meeting, individual semi-structured interviews using the photos were conducted to explore the following four research questions:

1. How do Black undergraduate women in engineering make meaning of sense of belonging and community?

2. How do the values of competition and individualism influence how Black undergraduate women perceive sense of belonging as engineering students?

3. How do Black undergraduate women navigate and negotiate community while studying engineering?

4. How is the intersection of race and gender represented in Black women's experiences of belonging in an engineering culture?

To analyze the data, all photos were organized into a PowerPoint slide and all interviews were transcribed. Using theoretical reading, all transcripts were read and re-read to compare how the data supported or disrupted the theories – Collins' Black feminist thought, Omi and Winant's racial formation, and Strayhorn's college students' sense of belonging. During this analysis other concepts and theories were explored. Based on the author's desire to use theoretical reading as outlined by Kvale and Brinkmann (2009) to analyze, disrupt, and interrogate the interviews, each research question response was analyzed using theories outlined for the study. Other theories and concepts were also utilized.

The results from this study are outlined in this chapter. First, the chapter describes the six participants in the study. The next section will provide findings that relate to each of the four research questions. Finally, a summary of the results section will conclude the chapter.

The words of the participants in this study affirm that sense of belonging plays a critical role in the experiences of undergraduate Black women. The undergraduate Black

women in engineering in this study sought physical spaces that perpetuated and supported their need for belonging and community. As described by Strayhorn (2012), sense of belonging plays an important role in persistence efforts for students of color. He stressed that sense of belonging is a basic human need that drives behavior. Participants in the study confirm that the need to belong drove their decisions for selecting community spaces where they felt as though they were valued and respected for their contributions. As evidenced in the interviews and photos, the participants in the study discussed their multiple communities as necessities to their success and survival as students.

The following section provides descriptions of the responses from the participants in the study. The sections are divided into four categories – each representing one of the research questions outlined for the study. The four categories include sense of belonging, engineering as competition, navigating and negotiating community, and intersections of race and gender. Each section will include participant responses followed by an interpretation of the findings.

Description of Sense of Belonging

This section is an overview of how participants responded to the research question of how do Black undergraduate women in engineering make meaning of sense of belonging and community? The responses provide definitions of how they classify their community spaces, types of communities they belong to, and the benefits of belonging to those communities.

Definition of Community

The concept of home or safe spaces permeated throughout the responses from the Black women in the study. When asked to articulate their own definitions of community

or sense of belonging, many of the women referenced terms like home or safe spaces to describe their communities. For example, Sophia states "community…it is like a homey feeling, like feeling at home or having pieces of something that reminds you of home." Sophia, a resident assistant, describes that even though she does not have a roommate she still feels like a part of the floor community when she opens her door and interacts with her residents. Their definitions of community also encompassed service to the campus community. Participants acknowledged that being a part of certain communities afforded them an opportunity to give back to other minorities. This was an important part of their involvement in their selected communities as service to others was a personal value.

Places of Community

Below are categories of different types of spaces that participants identified through the photo elicitation component of the research study. The categories also represent the communities of importance to the women. The women's spaces were organized into the following categories – outdoor spaces, identity exploration spaces, unique spaces, and spiritual spaces. Each category has several examples of how each woman described each space. In some cases, the role of relationships with staff, faculty, and other students were also explained. These physical spaces were most salient to the women in the study.

Outdoor Spaces as Safe Places

Several participants in the study reflected on the outdoor space as a place of belonging. Participants described spaces on and around campus that provided a space to reflect on their experience. In many cases, outdoor spaces represented an opportunity to reflect on being a part of a community that is much bigger than them. For example,

Sophia explains when she walks around campus she is mesmerized by the beautiful trees and the architecture of the buildings on campus (Figure 1). She reflects on the rooftop garden at the top of a building where she goes to relax, reflect and she often feels connected to the larger campus and the city where the college is located (Figure 2). Sophia acknowledges that she frequents several outdoor spaces around campus. She describes the flowerbeds and green space around the student union as calming (Figure 3). She describes the experience as, "a little piece of home."

Sophia describes a view she has from her chemistry lab of the city in which her institution is located as an opportunity to reflect on her experiences as a student. Sophia reflects, "so coming to the university and seeing all these huge buildings, it just reminds me of opportunities that the school gives us by where it's placed." She continues by stating, "and this makes me feel like because I'm here, I can do things. And they [the institution] give me the resources to do them." The view reminds her of the resources she has on and around campus. It also helps her to feel empowered to act and get involved on campus.

Angela also described an outdoor space that she frequents. This physical space is located in the center of campus and allows her the opportunity to reflect on the campus and the surrounding city. This outdoor space includes a large tower and a reflecting pool at the base of the tower (Figure 4). She states,, "I feel like I am a part of the campus or I have found a place on campus that other people have access to but I can you know kind of feel comfortable in as well." She acknowledges that there are few spaces that make her feel that way and that is why it is important to her. Though she does not often interact with other students in the space, many are often present, usually eating lunch or reading a

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book. It allows for an opportunity to scan the campus and see what types of activities are going on in the spaces.

Frances also presented a picture of an outdoor space that was symbolic of her experience as a college student. Each component of the picture represents something that she has reflected on during her time. She described the clouds as representing the obstacles she has experienced, the building representing the academic major she loves, and her hand represents her reaching for her passion as a structural engineer (Figure 5).

> And as you see the clouds resembles you know, I don't want to say struggles but obstacles that were in my way during my times here so I just felt like with this, it's just me being comfortable with my skin no matter what happens or no matter what tries to bear me in another way.

Frances continues by stating that her hand represents reaching out for her dreams and that she is more comfortable in her own skin. This was an opportunity for her to reflect on what is important to her as she prepares for graduation.

The outdoor spaces the women discussed in their interviews were important spaces for reflection. The outdoor spaces provided uninterrupted time to consider their reasons for being enrolled at their institution. Also, it was evident that the women used the spaces as time to consider their goals and aspirations. The outdoor spaces represent their connection to the larger university community.

Identity Exploration Spaces

Participants in this study also gravitated toward spaces that gave rise to opportunities that fostered identity exploration. The journeying process included exploring their identities of race, culture, gender, and their engineering identity. The

spaces allowed participants to engage in discussions about issues that directly impacted their identities as undergraduate Black women in engineering. Below examples of these spaces are discussed in detail.

Though a safe space to discuss issues and experiences for Black women college students among themselves was not discussed by any of the participants, it was a particular group of three Black female staff members that provided a safe space for many of the women in the study (Figure 6). The staff members were three Black women who were the women they sought for counsel, support, and affirmation about their experiences as Black women. For example, Mara described her relationship with the women of the Office of Engineering Outreach in the College of Engineering. Described as a safe space, Mara recounted her interaction with the staff in the office as a positive, affirming space where she can obtain advice about how to be a better student. "They understand the same sacrifices or the same obstacles that I'm enduring right now. I really think that their opinion weighs a lot, you know, weighs a heavy burden on me like I really take their being into consideration."

Also, Mara's description included the physical space of the office. It was described as clean, comfortable with staff that provided an environment that felt like a third space. Mara described this as a comfortable, warm space that seemed to be valued by the university because someone cared for its physical appearance. In her experience this was not the case for all minority designated spaces. This was a place where she could connect with the Black women in the office about topics that related to what it means to be a Black woman. She spent considerable time in their offices exploring how she wanted to be perceived by students and staff at the university. For example, Angela stated that

she was particularly grateful for the mentorship she received because she was considers changing her major.

> You know they have been a big support system for me since I've been here. I remember around this time last year even I was considering transferring out. I was considering changing my major and you know I had a lot of heartfelt conversations with them. They gave me the support to pretty much stick through it and I'm thankful that they did because I don't regret making that decision at all.

Frances also describes the sincerity that came from the Black women in the office. She described them as an advocate for her when situations seem unfair. Frances provides the following example.

> If we have a problem with a teacher, we could tell them [women in the outreach office] and they will report it in some kind of way. And that's what we need. We need somebody to support us through, you know, school. And without them as a resource, that would be just kind of sad.

For Maya, Angela, Frances, and Rebecca their relationship with the women in this office provided them with a space to feel open, honest, and vulnerable about the experiences of being a Black woman. In other words, the women were like "other mothers" - the women that stand in for one's biological mother.

Frances also shared that her experience with the office of outreach education was an important space for her. She described that their office serves as a resource that has helped her in her adjustment to campus as a transfer student. Her experience with the Black women in the office has helped her to feel as though someone on campus cares about her well-being. Frances stated,

I feel like that's the place for me because you know they are African American just like I am but I just feel like it was more of a family setting to where they'll look out for us, you know, African American students more than, you know, anybody else so we're-they'll be like hey, I got your back no matter what so I really am grateful to have that kind of help throughout my years.

In her interactions she is also able to explore what it means to be a Black woman in engineering. The women in the office have provided her the time and space to unpack what it means to be an undergraduate Black woman in engineering.

During the interviews, each of the women shared personal stories of how the women had helped them through situations that included finding faculty led research projects to helping them prepare for a conversation with a faculty member regarding an incorrect grade in a difficult course. The advice from the staff was particularly helpful because the women felt comfortable discussing how being Black women complicates their experiences as undergraduate engineers.

Angela spoke about a space on campus that she described as her third space. Disrupting the home/work dichotomy of many college students, Angela reflected on the Black student organization (BSO) office space on her campus (Figure 7). She explained the third space as

...a first space is considered home. Second space is considered work so work and home are the two places that we usually spend most of our time and then our third space is kind of the supplement to both of those and...like a home away from home in many ways. It serves an additional purpose outside of work and home that you really can't find anywhere else.

This space was pivotal in allowing her to discuss issues that she believed that only other Black students would understand. In essence, this is the space where issues of race could be examined in the context of being a Black engineer, a Black college student, and a Black American. In this space, she found sanctity in having the conversations about Black identity with other Black students. In many instances, the Black student organization office allowed for healthy dialogue – somewhat free of conversations filled with undertones of competition. The space felt communal.

Another space for identity exploration was through their involvement in student organizations. Angela's conversations about Black student issues extended into her involvement as an officer in other Black culturally - based student organizations. She stated that conversations about societal issues in the Black community were discussed both in and out of meetings. As an officer of a predominately Black student organization, she felt it important to discuss with the larger group any issues that she deemed especially important to Black students. Due to her involvement, she was instrumental in creating a forum for monthly meetings for Black faculty, students, and staff to get together and discuss campus wide issues. Though she received some push back from administrators, she was adamant about the need to create a Black issues forum.

Sophia provided another example of the role of student organizations. Sophia shared that her involvement in the African Student Association provided her with a space to be around others who understood and appreciated the culture of Africans (Figure 8). During these meetings, she interacted with other students who shared similar values. Sophia described her time in the organization as, "I got to go there and see people that

have the same viewpoints and have real discussions about different cultural changes from America and Africa, educational changes from America and Africa."

The African Student Association meeting and informal gatherings provided a stress free environment where Sophia could connect with other African students and reflect on their shared culture norms as African students. As a general body member, she found the meetings to be fun, however since becoming an officer, her commitment to representing the organization became her priority because she wanted other African students to feel like a community. She explains, "it just really helps to reach out to people that have the same cultural background or even like traditions being raised the same." This has helped members to feel like they could be themselves – free of judgment. For Sophia, the meetings became a safe space to discuss the similar ideas, values, and cultures. It was not only the individuals in the room that produced this type of environment, but the physical space in the student union made it feel comfortable and warm.

Sophia's experiences of community were also explored in the form of her identity as an engineer. She described two academic spaces where she explored her academic identity – the undergraduate learning center and the library (Figure 9). In the spaces, she interacted with other students who assisted her in developing her knowledge and skills as an engineering student.

> This area sometimes gets a little loud because people are collaborating but that's
> still good because like you hear someone talking about a class that you took. It's
> like, 'I took that, I know the struggle.' Or you'll hear someone and then they'll
> just come and help you like you're working on or you're not—'I don't

understand.' Sometimes, people just walk up like, 'yes, yes, this is not that bad, here's some tips.' You know, and it's really nice to know that other people also care and know what you have been through and happenings.

Sophia has found these two spaces as opportunities for her to collaborate with other engineering students. She has been able to build relationships that helped her develop empathy for others. During her times in the spaces, she is often motivated by being around other hard working engineers. This has been helpful in establishing her identity as a competent engineer.

Mara also described a space that enhanced her academic identity as an engineering student. She focused on a space designated for minority education on campus (Figure 10). The space provides academic resource support for Black and other minority students. Though the space has been designated for all underrepresented minorities, according to Mara, it is mostly accessed by Black and Hispanic students. Mara describes this space as

It's refreshing because you're going with other minority students and you're in there all for a particular reason like no one is just like in there to just kind of like hang out or make fun of other people or just to not do anything. People are usually in there seeking help, so it's good to know that everyone who's in there recognizes that they need help with something. And then two, it's actively seeking that help, so it's great that I go in there and we're on the same page.

She continues by stressing that students go there for the mutual goal of being successful in academics and career planning. Having this common goal helps her to feel a sense of community. She acknowledges that the space provides a community focused on academic

support for minorities, she believes the space has been neglected and is well overdue for a renovation. This has been a point of contention for her as she believes the lack of attention to the upkeep of the physical space sends a message that higher level administrators do not value the space as much as the students who are frequent users. Unlike the office of outreach, most of Mara's interactions are with other students and not the full-time staff because she uses the space mostly after hours. Also, to access the building, a student has to go through the back door after regular business hours. This has caused Mara some stress because it makes her reflect on her ancestors who could only walk through the back door to buildings. The idea of walking into a space designated for you through the back door seems antiquated and is frustrating.

Frances also shared that her materials lab has been a great space for exploring her engineering identity while also feeling like a part of a community (Figure 11). In this space, she has felt like a valued, contributing member of the research team. This has been one space that even though she is the only African American, she has felt that her input and skills are an important asset to the other group members. She states,

> so this made me comfortable to a point where I'm actually learning something that I'm very interested in and although I might be the only African American in there. So I feel comfortable in that setting because it just feels like it's just an open environment to where you're learning, you can ask questions and not feel like 'Oh, is that a dumb question?' and we're basically helping each other through each experiment.

Her materials lab experience runs counter to the interactions she had in other classes with her white, male peers. She has cited examples of being in civic engineering classes where

she has felt like an outcast. She would enter into discussions and found that her male peers would ignore her and overlook her response to answers. In certain classes, when group project work was divided up, she would not have any input into her work assignment. Her group mates would assign her the "easy tasks" such as putting together the PowerPoint. Attributing her classmate's reactions to her involvement as an ego problem, their behavior was confusing to her because it ran counter to her major's emphasis on being prepared for team-oriented work environments.

Frances also provided another academic space that has been a part of her community (Figure 12). She described a machine that tests the strain of steel. In this space is where she has learned more skills as an engineer, however she used the functions of the machine as a metaphor for her development as a young woman and as an engineer. The function of the machine is to stretch steel and she equated this process to her own personal stretching and growth.

> I could be stretching myself out to where I am knowledgeable in far more areas than just education – knowledgeable as a young woman, religion, and just basically making me more open minded to what I want to do in life. I know I want to have a career in engineer but also want to help other young African Americans get involved in engineering no matter what it takes…

Mara acknowledged her involvement in the society for women in engineering as a space to explore womanhood (Figure 13). Though she has noticed over the years, that few Black women are involved in the women's society, she has received great benefits from the relationships she built with other female students on campus. She described her involvement as an opportunity to discuss with other females similar issues they

experience on campus while also attending great professional development opportunities. Through the women's society she is able to give back by serving as a mentor to new female students. Mara describes this as comfortable space, however she is conscientious of her need to be politically correct and professional so that she can be considered for opportunities. She is still conscious of her race in these setting because she does not trust that others understand how race can impact your experience as a woman in engineering.

> This is a space where I really do sometimes feel like I have to be politically correct so sometimes, it's a space that I try not—unlike the EEO office or OMED, when I say things, I make sure that I say them properly and I enunciate all my words and I don't want them to not consider me for resources as a reason because of me being African American.

The role of the women's society helped her to connect with other women on campus and participate in mentoring that helped her to give back to the community. Though she is a bit guarded because she is unaware if the women in the group can relate to the intersections of her race and gender, she also discovered opportunities for personal growth and development.

In this section, several places were identified by the participants as spaces where they can explore certain aspects of their identities and in some cases, reflect on the impact of those identities on campus. The women provided examples of the ways in which their race, gender, and engineering identities were salient parts of their involvement in certain organizations. Each location was intentionally selected by each participant to serve the need of belonging.

Spiritual Experiences as Community Space

All the women in the study discussed in one way, their connection to spirituality as being an important part of their community experience on campus. When referencing spirituality, it not only included religious affiliation, but it also referenced soul searching unrelated to a faith based group. Spirituality helped the women feel as though they could connect with something bigger than themselves. It was through the spiritual connection that the participants felt like a part of a community.

In the interview with Angela she spoke adamantly about her experiences as a sophomore student. She described it as being a really hard transition filled with painful, unexpected family issues. To numb the pain of her family issues, Angela became over involved in campus activities and later found herself in academic trouble. She would say "It's what really kind of started a transformation for me, spiritually because to get through everything, you know I really had to dig deep and figure out who I was." During this low point in her collegiate years, she sought opportunities to connect with others and find her community. She also discussed her spirituality as a something that helped her to stay centered and motivated to complete college.

Identifying as a Christian, Sophia tells about a gathering with several campus members in a large auditorium in one of the buildings on campus. This was an informal gathering with approximately 40 students in attendance. With tears flowing from her eyes, Sophia described the experience as a stress reliever during finals week. Sophia stated "we just talked about how Jesus loves us and he like made it interactive like videos and people talking about their personal experiences. It just felt like everyone is here together." The scenario for her was powerful and she felt connected to others who shared

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her same faith. This was especially true when they sang an uplifting song together. She reflected on the experience as, "collectively putting our voices together to serve one purpose, that's pretty cool." This experience was really powerful to her because it blended several things that are important to her – faith, music, and community. This experience inspired her to create a new Christian based radio show for one-hour segment on the radio. This faith based community experience provided her an outlet to feel and give love through praise and worship. Though the campus, like many others, has several places for students to practice and celebrate their respective faiths, no students discussed going to one of the many campus religiously affiliated buildings on campus.

Mara reflected on her experiences with other Muslim students as a way to feel a part of a community. Her Muslim identity served as an important cultural marker for her. She said that though many of her Muslim friends share similar culture norms and religious views, however, group members did encompass some diverse perspectives that made their interactions even more valuable. She discussed these conversations as being important to her wellness as a student.

During the interview, Frances also expressed the importance of her faith. Frances' reference to her faith was through a symbolic picture of her purple book bag that bore a hand drawn cross and a scripture (Figure 14). When asked if the cross and scripture represented community, Frances agreed and stated that it made her feel like she was at her institution for a reason. "God is protecting me in everything I do, any path I go through and he has really helped me grow and mature as a young woman here." Frances acknowledged that she did not participate in any religious groups on campus but her faith was an integral part of how she viewed community on campus.

Kayla also discussed her spirituality as a part of her community. She provided a photo of their meeting location – the roof of an underground parking deck (Figure 15). It is on the rooftop, where the group meets to have their weekly Bible study. She states,

I can relate to the people there. We're all trying to be focused on, becoming better Christians even though we're surrounded by a lot of distractions and with school there's a lot of pressure so it's just the common place to come. And so we remember what's really important and just come together in this place.

She expressed that the common goal of becoming better Christians is what makes her faith-based community so important to her. The common goal has driven her to participant in their weekly meeting and it is a part of her community.

Faith and spirituality are an important part of their community experience. Whether the commitments to a faith are demonstrated through a one-time event or consistently during their college experience, it is an important factor for the women to feel like they are connected to something bigger than themselves.

Unique Spaces as Safe Places

The spaces described in this section may be deemed unconventional places to find community or belonging however, for the women in the study, these spaces, such as the dining hall, were very special places to connect with university staff and to feel as though they were a part of a community. Sophia describes three spaces that were unique to her campus experience.

For example, Sophia describing being a regular customer at a campus dining hall facility and feeling a part of the community because they show compassion and care about her (Figure 16).

It just makes me feel like a sense of belonging because they [food service staff] know me and they take the time to know the people that come in there…it just feels like home because the people are just so kind and they care for you. They're family. A lot of them I know by name too so it's just really nice and like if I do badly on a test, I can tell them and they're like, oh let me pray with you so we just like go on the side and they pray with me so it's pretty cool.

Sophia continues by describing the stain glass artwork in the cafeteria as a reminder of the students who came before her and their journey towards degree completion. This space reminded her that she belonged to a place much bigger than herself.

Sophia also found a sense of belonging in an office of a female faculty member she had for a general freshman chemistry course (Figure 17). She stated that she felt like she belonged in this space because every time she walked into the professor's office for assistance, the professor seemed interested in Sophia's visit. During the visit, she was able to get to know the professor personally and felt connected to her because of their shared value of the importance of family. This was a particularly unique space for Sophia because when she considers other faculty members; she would not have attended their office hours. Nor would she have found community in their office.

Sophia also described her experience of working with the college radio station as one that brought her a sense of belonging and community (Figure 18). She discussed the lounge area as being the place where DJs and their visitors would hang out before and after their radio shows.

And I guess it shows that although you are just staring at them through this glass, you're still a part of this student community and although we're in the radio,

we're like broadcasting whatever we want …it's really cool to see that different

people come…and being able to visibly see them from the glass because if it was

like a closed dark room, it wouldn't feel as open and community like, you can see

people walking by and people wave at you…

The radio station has several artifacts that contribute to the sense of belonging. For

example, they keep a journal in the station that current and former DJs use to write stories

about interesting experiences they have had while on the air. The space felt warm and

inviting because of the old, comfy sofa and the decor on the walls that represented the

array of artists played on the station. The artifacts included concert tickets, posters, and

flyers that advertised various musicians. This space has become quite special for her

because this is a way for her to connect with others who love music, but also with the

larger campus and city community.

Though participants rarely discussed feeling a part of the larger campus

community, Sophia shared a few examples of feeling as such during larger campus events

(Figure 19). For instance, Sophia attended an event at the beginning of the year that

introduced her to campus culture. During this event she enjoyed the camaraderie and

connectedness she felt as she heard the campus band play fight songs and she learned

traditions from upper-class students.

And so this picture made me feel a sense of community because like, everyone

was [there] together just to celebrate the traditions of the school that we're at. So

it was really wonderful just to be there and see the fireworks that they're putting

up for us and made us feel like we're important.

Sophia's experiences in the three unique spaces were important to describe because she was the only individual who spoke about a large campus event, dining halls, and the radio station as an example of finding community. It is important to note that only during the large campus event was she interacting with a large group of people. The other participants did not discuss other similar spaces on campus.

Rebecca also offered an example of a unique space. She has been very involved in a state sponsored organization that assists with the retention of students of color in science and engineering fields. Rebecca expressed that the monthly meeting sponsored by the organization have felt like a community because it is a small group of students who are striving to be successful in their respective fields. Rebecca states,

I am able to interact with undergraduates like myself, that's a must for a community with me. My fellow undergraduates as well as people who are below me are who we are trying to lift up. Lift them up here and say 'hey you can do this regardless of your situation.'

The unique spaces discussed in the above section provide examples for how the participants find community. It is in these spaces that Black women are able to draw from the relationships of various campus constituents to find community on campus.

In summary, the women in the study seek various campus spaces to find community and belonging. What classifies as community rest amongst the women in the study. The spaces play an important role for the women in the study because the participants have been able to explore their identities, find spaces of reflection, and assist with helping a group of minorities – undergraduate Black women find community on campus.

Description of Engineering as Competition

When asked if the campus culture was competitive, each participant unanimously agreed that this was a salient part of the campus culture. Competition was most prevalent when discussing grades with other students. Sophia describes the community as being dichotomous with some students wanting to help their fellow classmates improve in a course, while others will never support their fellow classmates. She argues, "There are people that are out there that are just like I want to do the best and I want to make sure I do better than you." In many ways, this philosophy runs counter to her desire to help other students. She believes that some students are competitive for the sole purpose of out doing other students. She on the other hand, has made a conscious decision to assist any of her peers her need academic assistance.

Frances shares a similar sentiment. Frances described the competition on campus as encompassing conversations about GPA, internships, and licensure exams. She describes the conversations among students as, "people here are like, you know, I got to pass this, I got to pass this so I can get a job because its so competitive." In her observation, competition hindered people from getting to know people on campus because they are so concerned about their credentials and internship opportunities. Over the years, she has learned how to lessen her worry about GPA. She says she has learned that it is about building relationships with internship sites and supervisors.

Rebecca also believes that the environment is competitive, but instead of being competitive herself, she is determined to be collaborative in her work. Rebecca believes that it is important to help others and to serve as a mentor to other students. It is so

important to her that she carries a dry erase board and marker in her book bag so that if she needs to assist a student with a problem, she has the necessary tools to do so.

> I really like reaching back and touching people. I feel like God is showing my gift on what I'm good. I'm good at talking to people; I'm good at hopefully encouraging people with. I love teaching. I love to teach. It's so bad that I have my own a whiteboard and markers I carry anywhere around. Just the white board down and show people like hey, this is how you do this.

Angela discussed the individualistic culture of campus. She describes her peers as students who want to know how they will benefit from participating in a particular class assignment or student organization. She describes that the competitive nature of students takes away from the genuineness of the campus community.

> The campus culture just doesn't breed an environment that you know forces community onto us, not in a genuine way. It forces community onto us in a trivial way you know that's focused on just gearing you to be in the industry and to be an industrial player but it doesn't really focus on a genuine sense of I'm here to help you.

It was interesting that even among her identified spaces of student organizations, she has witnessed a lack of community. As an executive board member, she and the rest of the board emphasize the importance of community to the general body membership however, many members do not see the value of community. This has been particularly disheartening because she learned from older Black alumni that community was an essential part of the Black student organization culture just a few years ago. She continues by then fragmenting the Black community into smaller sub communities – such

as athletes, fraternity/sorority members, leaders of Black student organizations, and Black students who do not affiliate with other Black students. She later questions whether Black students know the importance and relevance of Black student groups. Given some of her skepticism about whether Black college students can define Black culture and why it is important to their generation, she is not confident that her peers understand the value of community on her particular campus. She expresses that her motives for being involved in Black student groups is important because the institute needs to maintain a Black student organization presence on a predominately white campus. For Angela, black student organizations are a place of refuge. She explains the importance of refuge as,

> Having those people that you can go to…it helps build you up. Not just this place but the college experience, it's beyond getting a degree, you know, these are the years where you're really finding yourself and it's hard to find yourself if you don't feel comfortable being yourself. And if you don't have people supporting you or not having that refuge, finding yourself is going to be tough like I said…when you find yourself, it's usually you going through trial and error and going through some tribulations to get to that place and if you don't feel like you have a solid support system, you'll really feel like you want to give up – and this is speaking from personal experience.

When asked why Black student organizations and not women's groups, she stated that during her experience, she did not feel as supported because there was always an underlying issue of how race impacts her experience as a woman. She is not confident that her non-Black peers will understand how race intersects with her gender. For

example, she feels more comfortable talking with a Black male about her experiences on campus because of the commonality of culture specific issues they experience.

Additionally, the Black student organizations have a family-like atmosphere for Angela. She described being with other Black students as an opportunity to explore and enjoy her culture as a Black woman. For example, she has experienced challenges wearing her hair naturally. Her decision to wear her hair in an Afro has caused some controversy among her peers and professors on campus. For Angela the natural hairstyle provides confidence that she has not had before while also disrupting western standards of beauty. However, her choice of hairstyle has left her professors and others students questioning her level of professionalism. She does not worry about being judged by her Black peers because her hair represents an important part of her culture.

Kayla shared a similar sentiment as Frances. She stated competition primarily revolves around grades. Kayla describes that some classes only allowed a certain number of A's and B's in their course therefore her peers are vying for those grades. Comparing her experience of being at a historically Black university, Kayla described her science classes as being more collaborative and team oriented than what she is currently experiencing. Kayla has been disappointed by some of her peers who do not seem to care about others. She believes "I don't really care if everyone else has a good grade as well." Though she believes most students are competitive, she has found a group of friends who are not. Her friend group consists of other transfer students who do not value competition and are interested in developing genuine relationships.

Description of Navigating and Negotiating Community

For the Black women in this study too navigate and negotiate the community was something that was essential to their survival as students. This section will explain how the participants in the study navigated and negotiated the environment to find communities where they felt supported and not judged.

The participants would often enter the collegiate community through connecting with someone or an organization that was indicative of their race as Blacks. Though there was no guarantee that this would yield the level of support they deemed necessary to survive the engineering culture, these spaces were the places to start. For example, Mara described negotiating the community as rather difficult given her desire to first connect with other Black students. However, she soon became cautious of interacting with other Black students because she was unable to assume whether or not she would find commonalities with them. It was her interaction with a Black male in the Black student organization space that initiated this feeling. During their conversation, he was surprised that she was able to be admitted to the institution based on the high school she attended.

> I went into the BSO [Black Student Organization] office for lunch and I was sitting at the table and there were other people and the room and then they were talking about high schools and I spoke about my high school and I was just judged right there. It was like, oh, you're just happy you got into this college. I'm like, oh, I'm not. I was like, I chose this college. I had other colleges to choose from, you know, I could've gone to Duke; I could've gone to Emory. When can I just relax…like if I go into the BSO office or to go to an African

American Student Union event, or go into a NSBE event, sometimes you're being

judged within that too.

During their interaction, the conversation became tense as she felt required to defend

herself to another Black student who she assumed understood her struggle. It was the

interaction with this student that made her guarded about her interactions with other

Black students. There was a certain level of trust because of their shared identities as

Black students. This interaction affirmed her need for her interactions with the

professional staff because they were the only individuals she trusted. Mara expressed that

it was important for her to have a familial type relationship with other students.

Mara's navigation through the engineering environment consisted of her

developing relationships with administrators and students that provided her with safe

spaces. She describes her navigation as

I'm coming in here to honestly seek advice, you know, and somewhat giving your

all—I had always been told you need to get your life together. So these spaces

help get your life together. And then you can go back into the world with this

renewed sense of confidence and of spirit and compete well.

Mara discussed how important these spaces were because it is tiring to be in environment

where you felt you had to prove your worth and that you belong in the space. In her safe

spaces, she would often gravitate to individuals who she believed were empathetic. Her

safe spaces allow her to be vulnerable. She explains,

but outside the safe space, I feel like I have to give my all, all the time, you know.

I have to be the one to like be really proactive, I have to be the one to participate a

lot to make sure I have some kind of merit.

Mara describes that being vulnerable outside of her safe space can be seen as a sign of weakness as a Black woman in engineering. She worries that her peers and professors may believe she is incapable of doing the work required of her as an engineering student. Because of the stigma, she has always shown strength and resiliency. She provides an example of confronting a professor about an incorrect grade. During this meeting, she acknowledged that she used the wrong number throughout the problem, but her application of the formula was correct. It is important to note that the number she was supposed to use was an arbitrary assigned by the professor. She thought that it was unfair to be penalized for inputting the wrong number into the formula even though her use of the formula was accurate. When she met with the faculty member, she was frustrated with how the conversation was going because she did not feel as though the professor was being fair. She began to cry during the meeting and left feeling vulnerable and upset. She shared that her future interactions with him were awkward because he seemed condescending and demonstrated a lack of empathy. She describes it as

> And I felt like, he from then on was like, every time he would look at me and say something kind of like rude or something that was kind of sarcastic or was like do you understand that, I felt like I got a second look like is she going to cry again or what is she going to do next. I don't want to be treated like that. You just have all these emotions, you don't yell, you just cry and it's like I'm not upset, I'm not upset at you but I'm upset with how you're grading me and I'm more upset with myself for crying in front of you.

During her reflection of this example, Mara was upset with herself, but equally disappointed in how she handled the situation. She stated "and so I felt like that changed

his perception of me and I felt like I should've showed more confidence or exceeded that in some type of way by not crying, you know, by clearly articulating to him why. And I felt like I failed at that."

Angela's journey of navigate and negotiate community has been the crux of her personal development as a young adult. The ebb and flow of seeking a community while in college has been filled with growing pains and challenges. Unclear about how community impacted her experiences, Angela reflects on the intersection of community, self-identity, and confidence. Angela reflects,

Finding that community, feeling like I belonged in that community was a struggle. I'd say, it wasn't really until last year that I started being more comfortable with who I was and not being ashamed to show people that and I think because of that, I felt more of a community, so I don't know if it was necessarily the community itself changing or just how I viewed myself in the community. Or if my place and my purpose in the community are what changed but it definitely has in many ways.

Angela has placed significance on her responsibility as someone to help younger Black students navigate and negotiate the community because of the impact it has had on her own personal growth and development. She has taken an active role as an executive board member for the Black Student Union and has made it part of her personal mission to help new Black students adjust to being a part of an engineering school. The challenge of the navigating and negotiating the campus community has been why Angela takes pride in the work she does to help rebuild the Black community.

For Frances, navigating and negotiating community has been a learning experience. Frances described being one of the only Black students in her classes. She has learned that college is a microcosm of what she will experience in the industry. She argues,

> I would say it makes you grow as a person, makes you know how to deal with people of other cultures and you know their egos and stuff. So it makes you more aware of how people are and to, you know, be overwhelmed but, you know, just grow and expect that because when you get out to the career it is going to be either the same or even worse so you have to understand and know how to go through it and not worry to too much.

She then cites an example of competing for an internship with a White male student who had comparable credentials as her. Though she believed her GPA was higher and she has more internship experience, she did not receive the offer. She explains by stating,

> we basically have the same credentials, its kind of like he got it and I didn't get it at all and I did not get any explanation so I just kind of felt like well, that's the real deal here because I am just as smart as him, I'm just as qualified as he.

The negotiation of the environment has been a learning process for her as she prepares to enter into the workforce. Though she does not understand the reasons for not being selected, Frances trusts that this is part of her learning and development process.

Kayla navigates the engineering environment by befriending a group of students that share similar values - hard working and collaborative in their work. Her interactions with her peer group have provided her with a welcoming environment that is void of judgment. "So it just feels like a welcoming environment and feels like you can ask

questions like if I don't know something without being judged purely." This group has been particularly helpful because as one of the only Black female students in her major, it is comforting to be around a group of friends who are not judging her on her race and gender. Kayla reflects

> Because when you're the only one there, you kind of put a pressure on yourself that you have to represent. There's just not many in this field so I don't know – In a way, I just kind of want to see myself opening the doors to more people coming. I kind of want to set a good example, because I feel if I do well, people's perceptions will change and then they'll be more receptive to more Black women and Black people in general, and women in general coming into this field because now it is very rare in the field.

The black women in this study also used other communities to gain the experiences they need to survive the engineering culture. The women entered certain communities to learn tools such as networking, teamwork, and a host of other skills that may assist with their development as future engineers. For example, Angela referenced joining a women's organization to learn more about their resources. This for her was important even though she did not feel a sense of community or belonging in the group. Unlike her involvement in the Black student organizations, she was not expecting to feel connected to the students in the women's organization. The expectation to immediately feel as though she belonged in a Black student group was important because she identified as Black person, therefore she was disappointed when certain interactions with students involved in the Black student organization were disrespectful and painful. Therefore, her expectations of

the women's group were different and carried less importance than the Black student organization groups.

Description of Intersections of Race and Gender

The role of race and gender in the lives of the women in the study played an important part in how they were perceived as engineering students. The descriptions from the women in this study provide a lens into how their experiences are impacted by their race and gender. This section will provide examples of how the intersection of race and gender manifests itself in the lives of the undergraduate Black women in this study.

Angela speaks about her experiences of the intersection of her race and gender as an engineer major. She describes that outside her safe spaces such as the black student organization office and the minority education office, she feels like she has to put on a façade because she is not viewed as an equal member of the community. She states, that her race and gender carry on a certain meaning for how she is treated.

> When I first came here, I felt like I was constantly putting on a face throughout the day just because you know when you're in certain settings, people like to pretend like the stigma isn't there but as an African American student, especially as a black woman in these classes where I'm probably one of the only, if not the only, person in that class, I have to put on a different face just so I can be viewed as to the same caliber as some of my other peers who are not African American or just not women in general. I think there's definitely two layers to that from my standpoint but throughout classes and organizations, if they're not black student organizations, you know we're constantly putting on a different face just so we

can be viewed a certain way and still be respected in the same way as some of our

peers.

The importance of black student organizations, such as the National Society of Black

Engineers (NSBE) and the African American Student Union (AASU) has provided

spaces for her to feel as though she can be herself. She describes the meetings as places

where she does not feel judged by others and she can relax. When asked to expand on

how she believes she is perceived, she stated that at a predominately white university

with an engineering focus, she believed that Black people are not expected to understand

math and science as well as other groups such as Asian and White students. In her

example, she states,

> They'll [other classmates] overlook anything that I say until I get a higher grade
>
> on a test and then they realize that I actually know what I'm talking about but
>
> until that point happens, it's almost like they don't want to have to take into
>
> consideration anything that I have to say because they don't believe or they don't
>
> feel that I could possibly know as much as them.

Her perception of her peers is affirmed by one of her other Black female friends on

campus. She stated that her friend was the only Black woman in an ethics class and had

to endure her classmates' discussion that they believed the majority of Black students at

their school were admitted because of affirmative action. This was a deflating situation

for Angela and her friend, because it confirmed their theory that other students did not

believe they belonged on campus.

When describing herself Sophia views the intersection of race and gender in her

life as a Black woman. Sophia stated that it was not until recently that she began to

identify as more than just a human. Her concepts of race consisted of her identifying as part of the human race. It was not until she moved to a mostly white neighborhood during elementary school that she began to have "cultural shock." Her definition of race has moved from human to describing herself as African. Her African identity relates to her cultural upbringing and not just her skin color. Sophia also mentions that her cultural identity of being African has not evoked any incidents of discrimination. She attributes this to her relationships with various social groups on campus that are ethnically diverse. She acknowledges that although conversations about race, gender, and other identities happen in the African Student Association meetings, she believes that she was raised to think of everyone as equal. Even when she moved from Africa to America, she did not notice the race differences. This has, "resonated with me that everyone's the same." Though she described everyone as being equal, she did say that she believes she receives access to different opportunities through minority education services because she is a Black woman engineer. Her experiences as a Black woman engineer have been positive and she does not feel like she is judged by her race or gender. She notices the differences in race and gender when someone brings up the different percentages represented on her campus.

The intersection of race and gender in the lives of Black women in engineering is prevalent in their college lives. Participants in the study described belonging in the engineering community as a particularly complex process with race and gender playing a large factor into how they feel as though they are perceived by their peers.

Summary

The undergraduate Black women in this study are finding places for community and sense of belonging on their campus. The spaces have included outdoor spaces that allow for personal reflection while other spaces are included the opportunity to build interpersonal relationships with both students and staff. Each space has its own purpose for each woman and their decisions to join those communities are predicated on the whether or not the spaces align with certain values, but most importantly the women are concerned with whether or not they will be accepted as Black women engineers. This is a particularly important aspect to the women because these identities are important and are salient to how they view themselves. In cases were value incongruence occurs the women make decisions about how to negotiate and navigate through those communities. In the next chapter, the findings will be discussed in relation to the theories that have been identified for this study. The chapter will conclude with implications for future practice and recommendations for other research studies.

Figure 1: Sophia's view of outdoor spaces

Figure 2: Sophia's rooftop garden view

Figure 3: Sophia's flower bed

Figure 4: Angela's outdoor fountain picture

Figure 5: Frances conceptual photo of outdoor spaces and her hand

Figure 6: Mara's Engineering Education Outreach Office photo

Figure 7: Angela's Black Student Organization Office photo
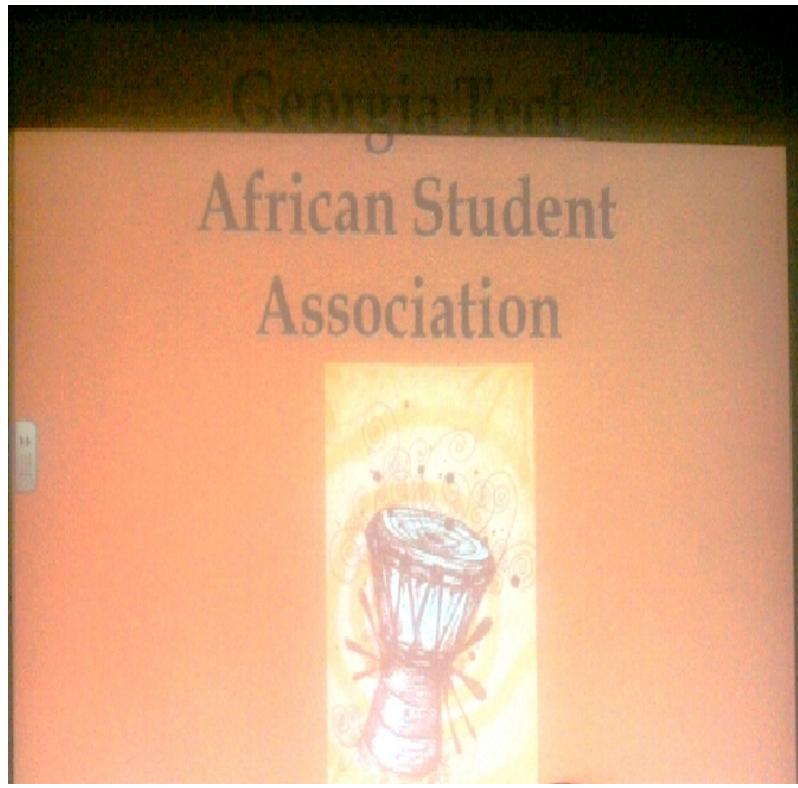
Figure 8: Sophia's picture of African Student Association
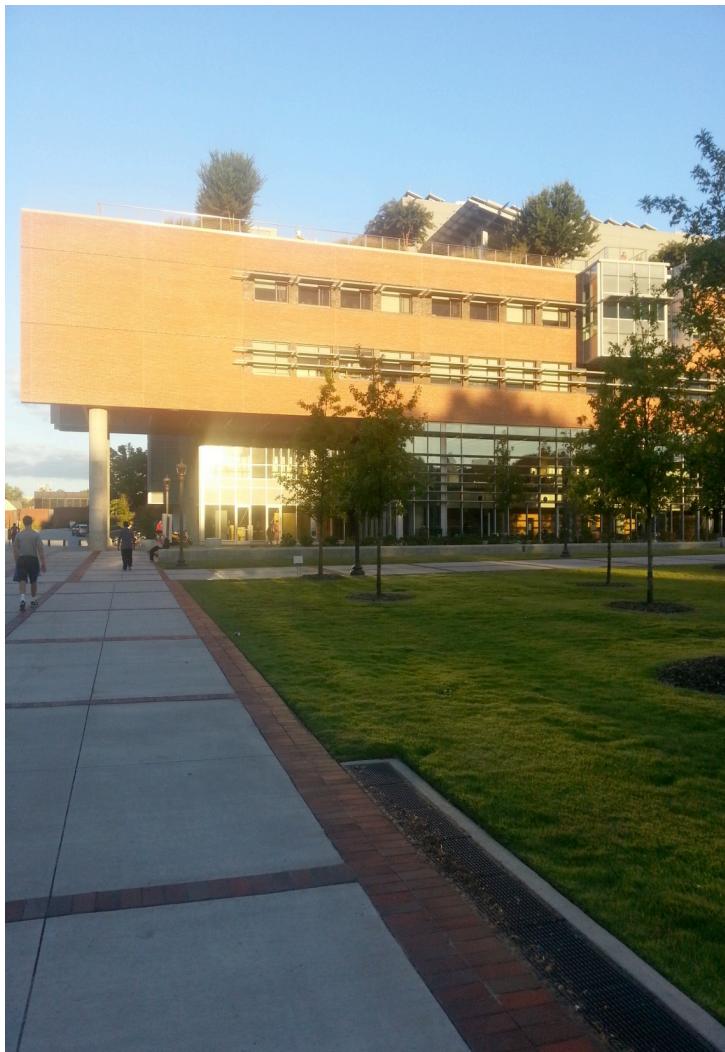
Figure 9: Sophia's academic identity spaces

Figure 10: Mara's photo of the OMED space
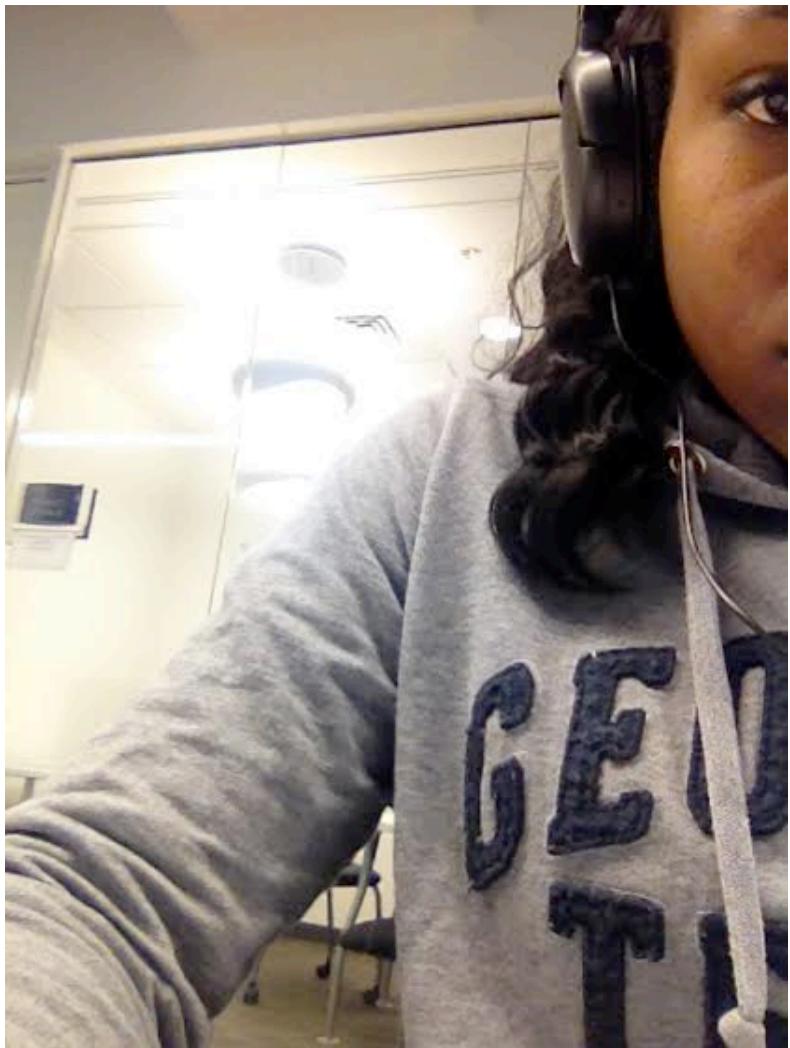
Figure 11: Frances' material lab space

Figure 12: Frances' equipment in her lab

Figure 13: Mara's picture of the meeting location for the Society of Women Engineers

Figure 14: Frances picture of a purple bag

Figure 15: Kayla's photo of her Bible study location

Figure 16: Sophia's Campus Dining Hall Facilities

Figure 17: Sophia's Faculty Office Interaction

Figure 18: Sophia's experience with the radio station
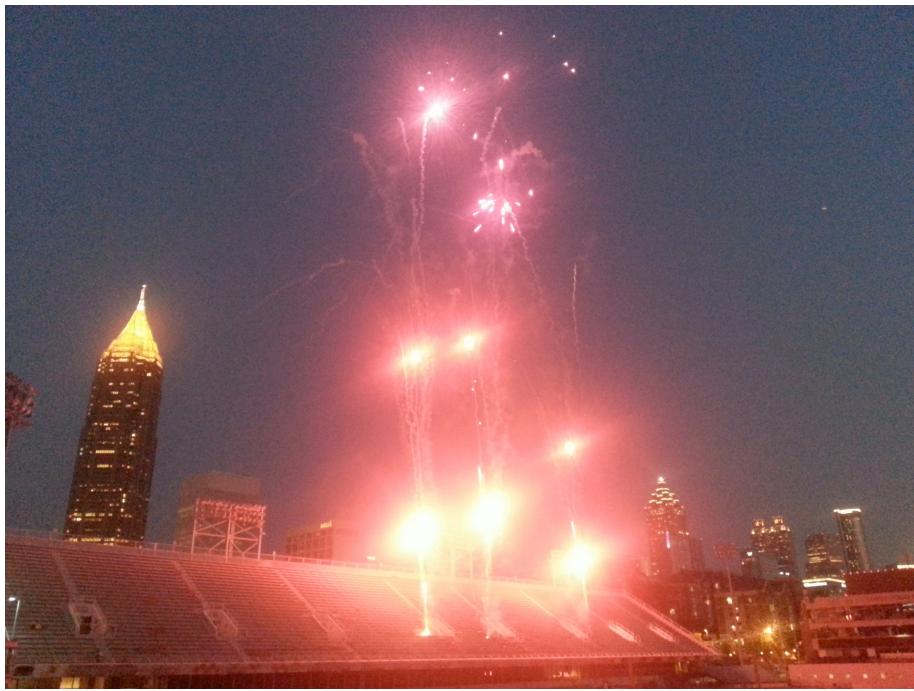
Figure 19: Sophia's picture from a large campus event

Figure 20: Rebecca's community in a state sponsored organization

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this study was to explore undergraduate Black women's sense of belonging as engineering students. The study addresses four research questions including how do Black women make meaning of sense of belonging, how do the values of competition and individualism influence how they perceive sense of belonging, how do they negotiate and navigate community, and how is the intersection of race and gender represented in their experiences. The study is an interpretive qualitative study that uses interviews and photo elicitation as the primary data collection methods. The study consists of six participants who were asked to take photos of spaces where they found community. After the photos were taken, the researcher used the photos to elicit responses during each semi-structured interview. Data analysis occurred using theoretical reading which included using three theories – Black feminist thought, student's sense of belonging, and racial formation to analysis, construct and deconstruct meaning around the interview data.

The purpose of this chapter is to discuss the findings as they relate to the theories outlined for this study. Additionally, the findings will also be discussed in relation to current literature that may support or disrupt any of the findings. The chapter will also include a section on the implications this study has on future student affairs and higher education practice. Finally, the chapter will provide suggestions for future studies.

Research Questions

The purpose of this interpretive study was to explore, while using the theoretical framework of Black feminist thought, how six undergraduate Black women make meaning of sense of belonging and community while studying to be engineers. The following questions guided this research study:

1. How do Black undergraduate women in engineering make meaning of sense of belonging and community?

2. How do the values of competition and individualism influence how Black undergraduate women perceive sense of belonging as engineering students?

3. How do Black undergraduate women navigate and negotiate community while studying engineering?

4. How is the intersection of race and gender represented in Black women's experiences of belongingness in an engineering culture?

In the next section, a review of how theory has informed the interpretation of the participant responses pertaining to the research questions is explored. The three theories under consideration include Black feminist thought, racial formation, and college student's sense of belonging. For the sake of the study each theory provided a lens to assist with the understanding of the different components of the study. In this study, Collins' Black feminist thought (2000) assisted with how the experiences of Black women are common and also unique to each other. The use of racial formation was important to understand the presence of race within social structures such as places of higher education. And finally, the student's sense of belonging provided a framework for

considering how a college student may experience belongingness as they navigate the community. Other concepts and theories are also considered.

Theoretical Analysis of Sense of Belonging

The first research question focuses on how undergraduate Black women engineers making meaning of sense of belonging and community. The campus community offered a number of spaces for community and belonging to be explored, however all were not classified as spaces that were conducive to providing a sense of belonging. The women in the study offered descriptions of multiple places on campus where they felt a sense of community. For example, belonging was described by using terms like "safe spaces" or places that felt like home. Each participant discussed a variety of community spaces they identified with as Black women on campus.

As described in the student's sense of belonging model, college students use a variety of campus places to find community. The participant's ideas of community resided among the smaller sub-communities outside of the classroom they found support in as they navigated the campus. In the case of this study, positive interactions with the campus community included: one-on-one interactions with staff, interactions with outdoor spaces, campus organizations and large-scale campus events. The physical places included outdoor spaces, offices, academic labs, and meeting spaces for student organizations. The importance of these spaces were not only depicted in the photos provided by each individual, but the photos allowed them to articulate how they made meaning of the interpersonal relationships within those spaces. The discussion about the photos also evoked a myriad of emotions that represented the significance of the spaces to their experiences.

Identifying places where one could locate a sense of belonging was very important for the women in the study. In alignment with the model, "sense of belonging takes on a heightened importance in certain contexts and at certain times" (Strayhorn, 2012, p. 20) for the women in the study. The context in this case is being a part of a small minority of students – undergraduate Black women engineers. Participants were aware of their identities as Black women and often commented that they had to prove themselves as competent engineering students. However, the heightened importance for finding community can be explained through the concept Steele has coined as stereotype threat. Stereotype threat is defined as a "predicament [that] threatens one with being negatively stereotyped, with being judged or treated stereotypically, or with the prospect of conforming to the stereotype" (Steele, 1997, p. 614). The predicament, in this case, is being a double minority in a field that is a predominately white and male.

Overwhelmed with the idea that many faculty and students do not believe they are smart enough to be engineers, it was especially important to demonstrate their math and science capabilities in the classroom. This was their attempt at disproving any negative stereotypes about Black women. As Angela noted in her interview, Blacks are assumed to be incapable of doing math and science work. As one of few Blacks in their classes, their heightened desire to represent their race in a positive light because, as acknowledged by Mara and Angela, the stress of proving oneself was often daunting. The stress of feeling judged negatively because of race and gender stereotypes was an overwhelming experience for the women in the study. Therefore, the need for spaces void of stereotyping was important and often described in the places they identified through the photos.

The undergraduate Black women in engineering in this study sought spaces where they found relationships with others that perpetuated and supported their need for belonging and community. As suggested by Collins, these safe spaces have been particularly important to Black women because they allow for "safe discourse [which] is a necessary condition for Black women's resistance" (p. 111). Participants in the study confirmed Strayhorn's assertion that the need to belong drove their decisions for selecting community spaces where they felt as though they belonged. Specifically, the women in the study established relationships with African American female staff members. It should not be underestimated that the women in this study were drawn to the Black female staff in the office of engineering outreach because this was a place that they did not feel marginalized or stereotyped. These relationships were sacred to the participants as they felt genuineness expressed by the staff members. For participants such as Angela and Rebecca, they felt love and sincerity that was not evident in other places on campus. This also became a place where they could resist being seen as the 'other.' It was a space where they did not feel marginalized because of their race or gender. Their conversations with the staff members would affirm their challenges and triumphs as Black women college students.

The participants in the study used cultural and raced-based student organizations and minority support offices as assumed spaces of solidarity and safety. Citing examples of raced and gendered micro aggressions, participants were aware of the need to find spaces that felt like home because they could openly explore the impact of the stereotypes they experienced. In their experience, safe spaces were void of the stresses of combating certain stereotypes and also served as a place to explore culture and race based issues

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they faced as students and members of society. The exploration of their identities as Black students was an important outcome of their involvement, primarily because of its saliency in their day-to-day lives. As Omi and Winant (1994) state race is a way of comprehending and explaining the world. Therefore the women in this study having a space to discuss these issues continue to be an important aspect for some Black college students. Opportunities to explore culturally based spaces were abundant however, the outcome of their experiences within spaces were not always what they expected. In a few cases, the participants would sometimes feel unfairly judged by other Black students.

The women did not believe that the classrooms were community friendly spaces. Thus, the women were drawn to other academic spaces where they feel as though their identity as engineering students was valued. As mentioned by Angela and Mara, the role of the Office of Minority Education is a place of community because it provided an opportunity to see other minority students focused on the goal of becoming the best students they can be. It is this shared goal of academic excellence that brings forth a sense of pride for the women in the study. The collaborative learning that happens in the office through tutoring and concept review sessions symbolized the importance of academic achievement. Additionally, Frances discussed two labs that not only make her feel like an important asset to her group members, but she takes great pride in being able to contribute to the goals of the group. In these spaces, the women's decisions to become engineers are affirmed.

As evidenced in the interviews and photos, the participants in the study discussed their multiple communities as necessities to their success and survival as students. The spaces where many of the women found community were categorized in three major

ways. The characteristics of an acceptable community included: finding spaces where individuals shared similar cultural experiences and values, being involved in communities that acknowledged them as capable engineers, and locating safe spaces that minimized their opportunities of being judged negatively because of race and gender. Finding these spaces were critical to their experiences as undergraduate Black women in engineering.

Theoretical Reading of Engineering as Competition

This section provides an overview of how the values of competition and individualism influence how Black undergraduate women perceive sense of belonging as engineering students. The section will highlight how theory helps to inform our understanding of the participant's challenge with competition and individualism.

The pervasiveness of competition in the campus culture exists. This is similar to other college of engineering programs (Seymour & Hewitt, 1997). The role of competition is experienced in various aspects of the college campus; however the women find ways to resist competition. Competition serves as a motivator in how the women disrupted the world around them. The women would maneuver through the competitive environment employing strategies of resistance. The Black women in the study are motivated to prove that they belong in the classrooms and labs as much as any other enrolled student. Competition, a value that is most commonly shared by the male students on campus, was most visible in academic spaces. Therefore, when asking the Black women in the study about community spaces, only two of the participants acknowledged their labs as places where they find community. The women provided ample examples of how important other students consider having the highest grades, best research

opportunities, or internships. Through these interactions, the women are constantly

disappointed in the level of academic secrecy and bragging that happens amongst their

peers. Additionally, the women who transferred from historically Black universities

noticed differences in the level of competition found among their students.

The women in the study who transferred from historically Black colleges

expressed differences in how competition was experienced at their previous institutions.

For example, Mara when describing her experience in a biology lab at her past university

reflected on how collaborative the experiments would be among her classmates. She

shared that her classmates would work on reports together to determine the best response.

This experience was similar to Kayla and Frances who both spoke fondly of positive,

collaborative experiences with their former classmates. All three women expressed that

their current institution was especially hard to navigate because they did not anticipate

the level of competition that they have experienced on campus. The women provided

several scenarios when competition was prevalent in the classroom and lab. This was a

difficult reality as many classes require group activities.

Each woman utilized their own way to resist the competitive culture on campus.

Resistance, a strategy often used by Black women to address the oppression they

experience as Black women, was employed in a variety of ways (Collins, 2000). For

example, Angela spoke about becoming active in black student organizations on campus

so that she could reemphasize the importance of community and collaboration among

other Black students. Rebecca, on the other hand, resisted competition by carrying around

a small dry erase board and marker so that she was prepared to assist any student who

might need academic help. This was an opportunity for her to collaborate and engage

students in the academic life of campus. In the case of Kayla, she opted for a peer group that valued collaboration. Kayla and her friends would work on group projects, share old tests, and teach each other how to complete various academic problems. All of the strategies were important ways for the women in the study to resist the culture of competition. Over time, each discovered her own strategies of navigating the culture of competition. In many ways, their forms of resistance were not only ways to resist competition, but also were opportunities to serve the campus community.

Another form of resistance for the women in the study was the idea of giving back to the campus community. Though the women did not always explicitly identify their campus involvement as service to others, it was important for the women to provide leadership in organizations where they felt like they could make an impact for the next generation of students. For instance, Rebecca, Angela, Frances, and Sophia all served in various leadership roles in organizations. Also, Kayla and Mara were heavily involved in mentoring programs for women and used this as a way to provide support and encouragement. Their motives were to encourage community and collaboration in their respective organizations because they believed it was vital to their survival as students.

Just as important as their identities of race and gender, was their identity as a competent engineering student. The saliency of one's academic identity was discussed in the sense of belonging model as an important factor for student's feeling connected to a college. Therefore, the need to feel positive, support in the construction of one's academic identity is especially important. The women in the study were no exception.

It was evident by their responses, however, that their academic identities were challenged in various spaces on campus. More specifically, the participants tell a story of

experiencing stereotype threat. It is important to note that the women in the study were confident that they had the skills needed to be successful, however it was the lack of confidence from others that drove their behavior. It was clear that self-doubt did not play a factor in how they felt about their capabilities as an engineer. Unlike the imposter syndrome (Clance, 1985), which contends that women feel over-evaluated by their peers, the participants in this study felt under-evaluated by others – having to make their peers pay attention to what they contribute to academic projects and spaces. The under evaluation is a product of the intersection of their race and gender. Proving themselves as competent engineers was described as demonstrating to faculty and peers that Blacks and women are capable of being successful with the academic workload that is required with being an engineer.

The Black women in the study did not approve of having to demonstrate to others that they could do the academic work. They were also disappointed that race and gender stereotypes stood as a barrier for how they were perceived by their classmates. The ideal that Black women in engineering often found themselves having to prove their place in the academia also resembles Collins' (2000) conception of controlling images. In essence, controlling images are those socially constructed ideas the majority group has that are designed to keep Black women in a subordinate position. In this case, it is the idea that undergraduate Black women are incapable of being engineers because of stereotypes of being lazy and intellectually inferior to others. For example, the participants provided stated that it was not uncommon for Black women to assume the role of note taker during group projects or by being assigned to making the final power

point presentation look 'pretty.' These roles minimized their ability to focus on the engineering concepts at the core of their projects.

The idea of having to prove oneself also disrupts what Collins (2000) calls self-valuation. In her theory, Collins emphasizes that Black women's role in developing a self-definition is crucial however, the academic identity that includes having to prove oneself as a competent engineer takes a toll on the identity construction of undergraduate Black women. The identity development process becomes complicated as one considers what does the intersection of my race, gender, and academic major look like for me? And how does the intersection of those identities impact how faculty and my peers might perceive me?

Some Black women in the study were disappointed that in certain spaces of refuge, such as Black student organizations, competition and individualism were still pervasive in these mostly safe spaces. It was as if the hegemonic culture in which they attempted to resist was infiltrating their most coveted places of refuge. Some of the participants, such as Angela, were shocked that what they assumed to be a value within the Black student community, collaboration, might be declining. This was disheartening as the women worked individually to develop community among Black students on campus. For instance, Rebecca mentioned the competition within the Black community was upsetting to her because as the face of a minority recruitment team, she could not confidently communicate to potential applicants that community within the Black student population was accurate on her campus. This was particularly problematic for her because she knew that community was essential to her survival and knew that other minority students would need the support. Overall, the solidarity they once perceived as

being a part of the Black community was changing and the women in the study were disappointed, because it had the potential of deteriorating the safe spaces used to discuss issues unique to all Black students on campus. Therefore, what is not clear is if the competitive culture of engineering diminishes the safe space environment among Black women college students with their Black male peers.

The women in the study did not talk about relationships with other Black women students on campus. This is particularly interesting as Collins (2000) writes that historically having safe spaces with other Black women has been an essential survival mechanism for Black women to navigate the demands of the oppression experienced because of their race and gender. What is not clear from the participants is if these types of relationships exist outside the college campus environment therefore the need for them may not be as important.

The women in the study repeatedly confirmed that competition was a prevalent aspect of the college culture. It was evident that the participants in the study used a variety of resistance techniques to address the pervasiveness of competition. The women used both their macro and micro level approaches to infiltrate the competitive culture that helped them move through and around the engineering culture of competition.

Theoretical Analysis of Navigating Community

The participants in the study used a variety of strategies to negotiate and navigate through the engineering environment. Each woman considered different paths to find communities that aligned with their values and felt like safe spaces. This section will provide a theoretical analysis of the responses to the research question of how do

undergraduate Black women navigate and negotiate community while studying to be engineers.

The women's decision to connect with certain places can be described using normative congruence. Strayhorn (2012) defines the concept as, "normative congruence suggests that individuals seek environments or settings that are congruent with their own expectations, values, attitudes, and positioning" (p. 20). In the case of the women in the study certain values and attitudes seemed to prevail. Certain values and attitudes that seemed most important were reflection, spirituality, identity exploration, collaboration, service and genuineness.

Collins (1990) discussed the role of Black women getting together in their own safe space. "Historically, safe spaces were safe because they represented places where Black women could freely examine issues that concerned us" (p. 110). Collins stresses the importance of safe spaces and is persistent in describing its necessity among Black women. The descriptions by the participants provided a different insight. Though a safe space to discuss issues for Black women college students among themselves was not discussed by any of the participants, it was a necessity for some to seek out the support of Black female staff members that provided a space for healthy dialogue about their experiences. In the space, with the three Black female staff from the office of outreach education, the participants found counsel, support, and affirmation about their experiences as Black women.

Additionally, the three theories under interrogation did not propose any thoughts about the connection of community through solidarity and reflection in outdoor spaces. Participants such as Sophia, Angela, and Rebecca placed great importance on the

opportunities to either sit outdoors or look out their windows to reflect on the importance of considering their purpose in a world much bigger than themselves. Though the theorists do not discuss it in their own work, reflection brings much utility to the importance of their day-to-day experiences. The opportunity to reflect motivates them to stay committed to their work as engineers. Reflection allows the participants to compartmentalize their time in college and to consider the experience as something that contributes to a larger purpose or life journey. It was during these times that each one considered defining their purpose as Black female engineers. As affirmed by Collins (2000) the need for Black women to develop their personal self-definitions are vital to their survival therefore, having spaces of solitude was an important part of their identity development and overall community experiences.

Watts (2003) affirms that Black women often use spirituality to cope with the demands of life. Similar to the outdoor spaces, the women discussed spirituality as a way to cope with the demands of the campus culture. Cautious to use the term religion to describe the experiences of all the women, it seemed important for some of them to connect with some form of faith-based community on campus. For example, Kayla meets with a group weekly to discuss how to become a better Christian. It was through these communities, that women were able to reflect on the meaning of their lives. For example, Angela found spirituality to be helpful during a difficult time she was having at home and school. Her spirituality gave her an opportunity to re-center herself.

The women in the study used several techniques to navigate and negotiate the engineering culture. They sought organizations and spaces that were congruent to their values. Additionally, the women found spaces and communities that fostered reflection.

These communities were in the form of both outdoor spaces and during faith-based gatherings.

Theoretical Analysis of Intersections of Race and Gender

The saliency of race and gender in the experiences of the Black women in the study are evident. The intersection of race and gender is often the first place they begin explaining their experiences as undergraduate Black women in engineering. More specifically, the women throughout their interviews consistently discussed the impact of race and gender in their everyday lives.

The overtones of race and gender for the Black women in the study are especially important to many facets of their collegiate lives. The women in the study find the intersection of race and gender to be an important part of their life experiences in many ways. In the study, the women establish that they believe they are treated differently because of their race and gender in a predominately white engineering school. This attributed to their small percentage on campus as well as preconceived notions about Black women and their contributions to engineering. The women also express that it is important to find spaces where they can explore and discuss the impact of their race and gender while studying to be engineers. And finally, the participants want to find spaces where they are accepted regardless of their race and gender. Therefore, the impact of race and gender has infiltrated many aspects of their college lives.

"To see racial projects operating at the level of everyday life, we have only to examine the many ways in which, often unconsciously, we notice race" (Omi & Winant, 1994, p.59). The women both unconsciously and consciously noticed that race and gender played a role in their day-to day-lives. To understand how race and gender

impacted the participants search for community in the study, it is necessary to consider their examples of interacting with faculty, staff, and students. The women in the study shared stories of interacting with faculty who seemed to discredit their abilities as engineering students. This was mainly during their professors office hours were they felt demeaned or belittled for asking questions about materials from lectures and recent tests. However, their most common example was that some of the participants were not taken seriously as engineering majors among their peers during class projects or group work. It was during these experiences that they described feeling ignored by their classmates as competent students. The interactions with their peers felt as though their unfair treatment was due to their race and gender.

The women also sought spaces where they could reflect on what it meant to be a Black woman engineer. In most cases, conversations around race and gender were explored in spaces with three Black women professional staff members who could help them process how to navigate through issues that seemed to occur because of their race and gender. These conversations were especially important for a few reasons. First, because the women would receive strategies for how to best handle these situations and second, the staff would provide a sounding board for the women to speak candidly about the issues related to being a Black woman engineer. It was during their visits with the staff that what Collins describes as a safe space was experienced.

And finally, the women sought and remained in spaces where they felt as though they were accepted regardless of their race and gender. It was in a variety of their spaces that woman sought refuge from the demands of race and gender. It was during the process of exploring these spaces that the women were often challenged to evaluate and

re-evaluate their relationship with the organization or to consider their own personal and professional development. In certain spaces, how the students made meaning of their race and gender were also important to their selection of spaces. It was evident that the spaces that honored the meaning making process were sacred and limited for the women in the study. At times, if issues of race and gender became a concern, they would consider the spaces utility within their own lives and determine if they should continue to belong.

It should not be a surprise that race and gender matter to the women in this study. At the core of their need for sense of belonging, Black women in this study were interested in answering, "Who will accept me – a Black woman engineer?" The expectation that all places on campus should provide a sense of community was an expectation that was never fully experienced by the women in study. It is also important to acknowledge that some of the women expressed apprehension with some spaces they identified as community spaces. This represented the process of evaluating and re-evaluating if this is a place where you felt like you belonged. In the words of Strayhorn (2012) students can find spaces "to which students feel connected, a part of, or stuck to a campus…" (p.17). However the idea that some women in the study still felt guarded in certain spaces was of particular interest as it suggests that Strayhorn's concept of "connection" or "feeling stuck to a campus" may need to be explored in more depth. It also raises the question of whether community for Black women is experienced on a continuum with isolation being on the other end.

Contrary to the student's sense of belonging model, the women in the study articulated the process of selecting and finding communities of belonging. In Strayhorn's model, the process of selecting of community is minimized however the women in the

study use it to justify their decisions in selecting their safe spaces. This is a crucial aspect of their experiences. Highlighting the importance of the process of finding a sense of belonging was insightful to how we understand the experiences of the women in the study.

The women bring heightened awareness to the idea that they are being judged as engineering students because of their two socially constructed identities, race and gender. This dictates in many ways their decisions for why they enter into and remain in certain spaces. For instance, the women in the study never discuss the classrooms as a place where they feel a sense of belonging. It is in these spaces that they often feel isolated or pre-judged by their peers about their math and science abilities.

During the introduction of his model, Strayhorn stresses that his work should not be considered a deficit model for how practitioners and theorists understand student's sense of belonging. Though he promotes his work as an asset model, he does mention that one cannot forget the other side of the belonging coin – isolation. Agreeing that a deficit model may not help one to understand how Black women articulate community and belonging, it does seem more appropriate to consider the experiences of Black women and community, not in the form of the belonging/isolation binary, but on a continuum where they are constantly moving through a series of emotions, situations, and reflection points that help them to understand the complexities of the intersection of their race, gender, and major as engineers.

Sense of belonging for the women in this study was as much about the process of becoming a part of a community as it was about the outcome of finding spaces. Meaning, the process of how the women selected their places of community was as important as

finding a community where they felt as though they belonged. Participants in this study were asked to consider how they selected their places of community however, it was evident that it was also about who was willing to accepting them as members of the community. Therefore, it was also as much about choosing the space as it was about being a chosen member of the space.

The findings from the study offer a process when thinking about undergraduate Black women's sense of belonging in engineering. First, participants wanted to enter into spaces that would answer yes to the question – "Who will accept me as a Black undergraduate woman in engineering?" The participants would seek out organizations, staff offices, faculty, and outdoor spaces to test this question. During the process of entering into the space, the participants seemed to evaluate and re-evaluate if this space aligned with their own values. The participants also determined if the environment seemed welcoming to them as Black women. During this time of evaluation, the participants decided their placement on the belonging/isolation continuum. Once this was determined, the participant would then make a decision for how they would interact with the space and the people within it. In some cases, in places such as classrooms or labs, the response was to engage in the space by using their own strategies to resist experiences of race and gender discrimination. In other places, such as the outdoors, the space was used as a reflection. And in other spaces, the space was used as a place of refuge and safety from those experiences that brought heartache and disappointment. Throughout this process it is important to note that how they were treated as Black women was always under consideration.

Implications for Future Practice

This section will provide suggestions for student affairs and higher education practitioners for future practice based on the results of the study. These implications are intended to extend the effectiveness of the work as a practitioner.

The women in the study found deep appreciation for three Black women staff members in the office of outreach education in the college of engineering. The roles of the women in the study provided a sense of home that was important to their success as students. From the participant's reactions to the women in the office, it is critical to understand that relationship building and mentoring remains an important aspect of the collegiate experience for Black women. It also affirms the necessity of the role of the Black female staff regardless of their major. For Black female administrators it is vital to consider how do we continue to make ourselves visible so that the students know that we care and can be considered safe spaces for community dialogue.

It is also important for administrators to remain supportive of Black student organizations on their campuses because for some students they serve as an entry point to finding community. The students needed these organizations to sustain conversations about what it means to be a minority in engineering. It was an essential place for the women in the study to find places to serve and develop leadership skills. It is imperative for administrators to continue to support culturally based organizations because they promote identity development and leadership skills for the members involved. Culturally based student organizations also serve as a place for dialogue about topics of race and gender, which may be omitted in the academic curriculum given the priority of their

institutional mission. The dialogue should be considered helpful in the development of the student identity and navigation through the environment.

The participants in the study also grappled with what does Black culture mean for their generation. Though this is not a new concept for Black students, it is important that administrators continue to help students understand there is no monolithic understanding of Black culture. The intersection of class, race, and gender for Blacks provides ample examples of the complexities of Black culture and values. This is particularly important to discuss as this is a pivotal time when students are exploring their identities.

The implications of the study also suggest that faculty in student affairs and higher education preparation programs need to continue to work with future practitioners on the concept of intersectionality. More specifically, the women in the study draw our attention not only race and gender identities, but how those identities intersect with their academic identity as engineering majors. This brings focus to a critical, yet often omitted, identity for women in the study.

The implications for practice hone in on the importance of mentorship, the continued need for Black student organizations, intersections of academic identity and explorations of Black culture. All areas lend itself to conversations that are important to Black women college students on predominately White campus.

Implications for Future Research

This study has focused on the bounded experience of sense of belonging on a college campus for a specific group of students. The findings and conclusions raise observations about the common experiences of the women in this study however; it also poses additional research inquiries that need exploration.

It has been noted by Black feminist writers (Collins, 2000; hooks, 2000) and higher education scholars (Howard Hamilton, 2003; Winkle Wagner, 2009) that the role of the family is a major part of Black women's college experience. Thus, it is especially important therefore to include opportunities for Black women to discuss this dynamic of their lives in relation to sense of belonging and community. For the sake of further research about Black women and sense of belonging, it is also important to consider the role of the family in their process of navigating and negotiating college communities.

As noted earlier in this section, the focus of the study was on a narrow group of undergraduate students – Black women engineers. A study exploring sense of belonging with Black women in science, technology, engineering, and mathematics (STEM) may provide additional insight into how this population finds and establishes community while matriculating as undergraduate students. This type of inquiry will glean the similarities and differences among the various science and technology majors. Researchers suggest (Seymour and Hewitt, 1997) that there are nuances among the different STEM majors that make implications unique and different for various student populations.

None of the participants in the study discussed relationships with other Black women students. A study focused on how Black women seek friendships with other women while in the STEM environment may be useful. This type of study would lend itself to understanding how Black women making meaning of issues related to their gender. It is important to note that all but one of the participants in this study belonged as a member of a women's organizations such as a sorority or society of women engineering

groups. Their involvement may have influenced their opportunity to have dialogue about Black women's issues.

Additionally, the study is focused on undergraduate Black women in engineering. It may be useful to consider studying how graduate Black women in engineering find community. With an even smaller population of women in the field, it would be useful to understand what role community plays during the isolated experience of being a graduate student.

Conclusion

During a recent visit to The Michael C. Carlos museum at Emory University, I was introduced to the artwork of Romare Bearden entitled, *A Black Odyssey*. The purpose of the exhibit was to display his interpretation of Homer's *The Iliad* by taking "the elements of African American life and placing it in a universal framework" (http://www.sites.si.edu/romarebearden/). It was in this exhibit that Bearden retells the story of a heroic voyager by the name of Odysseus. The stories depicted in the artwork are filled with breathtaking accounts of challenges and triumphs throughout Odyssey's journey to home.

It was while walking around the gallery, filled with his boldly colored collages and drawings, that I was reminded that the story of finding home can be interpreted in many ways especially considering factors such as race, gender, and in the case of the women in this study, engineering. As I proceeded to walk around, the curator made reference to questions that Bearden considered as he developed his artwork. The questions offered by the artist through the lens of the curator were focused on what it meant to journey home. I could not help but consider how the questions might be

answered by the participants of this study - How might threats and changes appear to be the only constants? What happens when the home one finds already seems to belong to someone else? How can we find our way to family and home?

In an ironic way, the artwork and questions from the Black Odyssey drew me into thinking more about how Odysseus' travels paralleled that of the Black women in this study. The journey of finding places and communities that felt like home for the women was particularly important as this is where they felt the safest and most vulnerable while on campus. They experience both triumphs and challenges as they navigate the campus community seeking spaces that will be void of threats to who they are as undergraduate Black women. Or do they even feel a sense of home while casually walking through campus or does the belongingness only happen in pockets of community around campus?

The exhibit in conjunction with the findings from the study, confirm that the women in the study desperately wanted to find home on campus. Like many of us, who are searching for belonging and community, all we ask is to be accepted for who we are and what we can contribute to the space. Similar to Odysseus, the women in the study are trying to find their way home.

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APPENDIX A

Email Solicitation

Dear Prospective Participant,

This email serves as an invitation for you to participate in a new research study of how Black undergraduate women in engineering make meaning of sense of belonging in the context of an engineering school. In particular this study focuses on students who identify as African American/Black women.

Participation in the study would require a very limited amount of your time. The conversation will have no academic science or math questions and no right or wrong answers; they are designed to understand your thinking about sense of belonging and community as a Black undergraduate woman majoring in engineering. You will be asked to take photos of places of community on campus. All interviews in this study are audio taped and typically take one to one-half hours. There will be both general and specific questions about you, your schooling history, photos and experiences in engineering.

Permission will be asked to audiotape the interview. If you agree to being audiotaped and become uncomfortable with any portion of the interview or recording, you are free to stop the recording at any time.

Participation in the study is completely voluntary. I have reviewed its design and I would not be making it available to you if I had concerns about how it will be conducted. The study has been reviewed and approved by the University of Georgia and your university's Institutional Review Boards.

Questions should be addressed by Sheree Gibson, doctoral candidate, University of Georgia, who will conduct the interviews.

If you think you would like to participate or have questions regarding the study, please contact Sheree Gibson by email at sgibson1@uga.edu and include the following information:

Name: E-mail address:

Phone number:

I am a sophomore, junior or senior level engineering student at my institution. Please consider me for participation in this study. Sheree Gibson will be interviewing the weeks of September 3 and 10th, 2013. At that time, you would be given complete details about the study as part of the informed consent process before you make a final decision to participate.

APPENDIX B

Interview Guide

Research Question 1: How do Black undergraduate women in engineering make meaning of sense of belonging and community?

- You were asked to take pictures of places on and off campus, where you have found community and/or belonging while being a college student. Can you please describe the picture(s) you have taken and their significance to you?
- What makes up a community? Who is a part of your community? What role has community played in your college experience?
- Can you describe a time when you felt social support on campus?
- Can you describe a time when you felt connected to others on campus?
- Can you describe when you felt least connected to the campus community?
- How do describe connectedness?

Research Question 2: How do the values of competition and individualism influence how Black undergraduate women perceive sense of belonging as engineering students?
- Would you describe engineering as competitive? If so, where is competition prevalent?
- How does competition impact your ability to connect with others on campus?

Research Question 3: How do Black undergraduate women navigate and negotiate community while studying engineering?
- Does being a Black women impact how you connect/relate with others on campus?
- Describe what steps you have taken to feel like you belong to the campus community?
- How has your sense of belonging changed since coming to campus?

Research Question 4: How is the intersection of race and gender represented in Black women's experiences of belongingness in an engineering culture?
- Can you describe your community on campus?
- How has your community changed since coming to campus?
- Can you describe a time when you felt like a member of a community while on campus?
- Can you describe a time when you did not feel like a member of a community on campus?

- How would you describe community at your institution to someone who is not as familiar with this campus?

APPENDIX C

CONSENT FORM

Black undergraduate women's sense of belonging as engineering majors

I, _____, agree to participate in a research study titled "BLACK UNDERGRADUATE WOMEN'S SENSE OF BELONGING AS ENGINEERING MAJORS" conducted by Sheree Gibson from the Department of Counseling and Human Development Services at the University of Georgia (542-1812) under the direction of Dr. Richard Mullendore, Department of Counseling and Human Development Services, University of Georgia (542-1812). I understand that my participation is voluntary. I can refuse to participate or stop taking part at anytime without giving any reason, and without penalty or loss of benefits to which I am otherwise entitled. I can ask to have all of the information about me returned to me, removed from the research records, or destroyed.

The reason for this study is to understand the experiences of sense of belonging for Black women who major in engineering as undergraduate students. If I volunteer to take part in this study, I will be asked to do the following:

- To take pictures that represent physical spaces where you feel a sense of belonging or community
- Answer questions about my experiences of community as an undergraduate student in engineering
- To participate in a 60-90 minute interview
- Have my responses audio taped to be further used by the researcher

I understand that the researcher will not benefit directly from the study nor will I receive any direct benefit by participating. THE INFORMATION GLEANED FROM THIS STUDY WILL PROVIDE COLLEGE ADMININSTRATORS INFORMATION ABOUT UNDERGRADUATE BLACK WOMEN. THE INFORMATION WILL INFORM FUTURE PRACTICE AND POLICY. No discomforts or stresses are expected. No risks are expected. The only people who will know that I am a research subject are members of the research team. No individually-identifiable information about me, or provided by me during the research, will be shared with others, except if necessary to protect my rights or welfare WITHOUT MY WRITTEN PERMISSION UNLESS required by law. I will be assigned a pseudonym and this pseudonym will be used on the questionnaires and interviews I complete. IDENTIFIABLE INFORMATION WILL BE RETAINED FOR UP TO ONE YEAR FOR THE PURPOSE OF CONTACTING YOU ABOUT YOUR RESPONSES. ALL IDENTIFIERS WILL BE REMOVED FROM THE TRANSCRIPTS AFTER ANALYSIS IS COMPLETE.

I acknowledge that the tapes will be stored and locked in the home office of the primary researcher and will be used for educational research purposes. I have the right to review/edit the audiotapes at any time. NO AUDIO RECORDINGS WILL BE PUBLICLY DISSEMINATED. ALL AUDIO TAPES AND EMAIL CORRESPONDENTS WILL BE DELETED ONE YEAR AFTER THE INTERVIEW. The researcher will answer any further questions about the research, now or during the course of the project, and can be reached by telephone at: 614-327-5243.

I understand the procedures described above. My questions have been answered to my satisfaction and I agree to participate in this study. I have been given a copy of this form.

_____   _____   _____
Name of Researcher   Signature   Date

Telephone: _____   Email: _____

_____   _____   _____
Name of Participant   Signature   Date

Please sign both copies, keep one and return one to the researcher.

Additional questions or problems regarding your rights as a research participant should be addressed to The Chairperson, Institutional Review Board, University of Georgia, 629 Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-3199; E-Mail Address IRB@uga.edu