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Do I belong? Narratives of sense of belonging and fit from underrepresented African American and Latina women in science undergraduate majors

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DO I BELONG? NARRATIVES OF SENSE OF BELONGING AND FIT FROM UNDERREPRESENTED AFRICAN AMERICAN AND LATINA WOMEN IN SCIENCE UNDERGRADUATE MAJORS

by

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Dedications

I dedicate this dissertation to Jocelyn Moore, my daughter, for your patience, love and support; my sister Tevina Haircrow for always believing in me. This research was completed in loving memory of my parents Yolanda and Andrew Haircrow.

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Abstract

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The purpose of this qualitative study was to explore the sense of belonging of underrepresented African American and Latina undergraduate women in science majors. More specifically, the study focused on the factors that contributed to the participants being engaged or disengaged in the science campus community. The use of narratives provided a detailed understanding about experiences that described the participants' sense of belonging at the higher education level. Sense of belonging was used as a framework for understanding the experiences and the motivation of African American and Latina undergraduate women studying in a science major. The research method utilized for this study was narrative inquiry. Twenty undergraduate women participated in a two-tier data collection process. In the first tier, eight participants provided their personal narratives through semi-structured interviews. In the second tier, five focus groups were conducted. Analysis of the data and interpretation was guided using the hermeneutic circle of understanding. The major findings of the study are that the participants felt a sense of belonging because of the ongoing support from family, peers, the campus-learning center, and the minority science program. Other factors such as motivation to succeed, overcoming stereotypical barriers, academic challenge also contributed to their experience in the science campus community.

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

Table of Contents (Continued)

List of Tables

Chapter 1

Introduction

Humans have an automatic need to belong. Belonging is so important to human nature that Maslow positioned it on his hierarchy just before safety and physiological needs. Hagerty, Lynch-Sauer, Patusky, Bouwsema and Collier (1992) define a sense of belonging as "the experience of personal involvement in a system or environment so that persons feel themselves to be an integral part of that system or environment" (p.172). For a sense of belonging to develop it is necessary that the individual experience a fit, acceptance, or connection with people, groups, organizations or environments (Hagerty et al., 1992). Although undergraduate institutions of higher education aim to promote inclusive academic environments for underrepresented groups, African American and Latina women experience a variety of thoughts, feelings, and behaviors that impede their development of a sense of belonging within the science campus community at post-secondary institutions (Strayhorn, 2012).

Educational researchers have argued that belonging has a particularly dramatic effect on students' achievement, especially for minority students and women in overwhelmingly male dominated majors, such as science (Hurtado & Carter, 1997). Several studies have examined the concept of belonging to identify why minority women have a tough time fitting into university science communities (Johnson, 2012; Smith, Lewis, Hawthorne & Hodges, 2013; Hazari, Sadler & Sonnert, 2013). In their investigation researchers have described many science environments as white male dominate settings, which contributes to the difficulties these students experience in

achieving a sense of belonging (Seymour & Hewitt, 1997; Johnson, 2012; Good, Rattan, & Dweck, 2012).

The basic problem remains that the number of African American and Latina women in post-secondary science classrooms and in science career fields are sparingly low (Ware, Steckler & Leserman, 1985; Seymour & Hewitt, 1997; Blickenstaff, 2005; Crisp, Nora, & Taggert, 2009; Espinosa, 2011). This phenomenon hinders the pressing need of the United States to recruit and retain women and minorities in science careers. The impact reaches far beyond the African American and Latino community as America struggles to produce enough scientists to thrive in a world heavily influenced by technology (National Science Foundation, 2013). This problem is more prevalent for African American and Latina women who enter higher education with the initial intent to study science, but lose interest and leave the major (Seymour & Hewitt, 1997; Allen, 1999; Lee & Davis, 2000; Villarejo, Barlow, Kogan, & Veazey, 2008). Without a sense of belonging students are less likely to feel connected to the science environment. Students lack the desire to engage and develop meaningful relationships with faculty and peers when they do not feel like they belong.

In a study conducted by Shehab, Murphy, Davidson, Foor, Rhoads, Trytten & Walden (2007) the researchers highlight some the possible reasons why minority students do not persist in the Science Technology Engineering and Math (STEM) disciplines at institutions of higher education. The researchers disaggregated the experiences of students from various minority groups. They examined the academic struggles that are most common among African American, Hispanic, Native American, and Asian American engineering students and the coping mechanisms used to overcome barriers to

success. Their study consisted of 160 participants. 46 were African American students, 42 were Hispanic students, 38 were Asian American students, and 34 Native American students. They found that among the top struggles minority students mentioned regarding persistence were maintaining good grades, poor academic preparation for college, feelings of isolation, gender discrimination, extensive course loads, course content and structure; many of these identified struggles often go unnoticed which causes the students to fail.

In the same study, both African American and Hispanic students mentioned a significant factor associated with experiences they had in the STEM discipline was poor preparation from high school. These students mentioned that they felt poorly prepared for college once they attended math and science courses on campus. One Hispanic participant spoke of a misconception after taking advanced courses in both math and science during high school. She soon discovered that her high school academic preparation was insufficient (Shehab, et al., 2007). Another African American student also had a similar experience. She mentioned that academic and cultural experiences were among the top struggle for her in the STEM major. The academic expectations and rigor of college courses had become a challenge.

Both African American and Hispanic students in the study also reported feelings of isolation however, African Americans reported the strongest feelings of isolation particularly in the classroom settings. The participants mentioned having a tough time communicating with predominately White sets of classmates. Additionally, the participants reported feeling intimidated by peers and faculty and were less likely to speak up and ask questions in class. Hispanic female participants reported gender

discrimination regarding stereotypes of Hispanic women by others in regard to them being passive and not having goals that did not involve having children. The Hispanic participants felt that male students overlooked their academic abilities and contributions.

Ong (2001) emphasizes additional challenges, which may cause women of color to leave the major. These challenges include but are not limited to isolation from others in the science and engineering major, not belonging, invisibility, and disconnects from outside social and cultural connections. Furthermore, Trenor, Yu, Waight, Zerda, & Sha, (2008) illustrated how the lack of belonging within the science and engineering disciplines can be a barrier to persisting in the major. Trenor et al. found that when Hispanic students experienced encouragement in the science campus community they were more likely to pursue an engineering degree, as Hispanic parents did not stress a specific major when encouraging their children to go to college and earn a degree. African American participants credited their parents for helping them overcome obstacles and challenges experienced in the science and engineering classroom. Other reasons that contribute to the minority science problem include, gender expectations (Reyes, 2011); negative stereotypes (Selwyn, 2007); race and ethnicity (Caroline & Johnson, 2007); lack of recognition from professors (Johnson, 2007); and identity issues (Settle, 2001).

While a great amount of research has been conducted investigating why women may be underrepresented in science, less is known about experiences of belonging in the higher education science environment for different groups of students, such as African American and Latina women, particularly from a qualitative perspective. This study is one step in the direction of highlighting the need to improve the participation and performance of science degree attainment of women. Highlighting the experiences of

belonging, cohesion, and fit of African American and Latina women in science will bring out interesting conversations for educators and students alike.

Sense of Belonging in Higher Education

The degree to which minority women feel they belong or fit in higher education can have a significant impact on their academic and social experiences at the institution (Strayhorn, 2012). Researchers have studied belonging and note that it is one of the indicators that shows how well students integrate into the university and how successful they are in a science discipline (Hurtado & Carter, 1997; Strayhorn, 2012). In a study conducted by Hill, Corbett, & St. Rose (2010), undergraduate women described feeling like they did not belong or fit into the Science Technology Engineering and Math environment at their institution. The participants of this study reported leaving the STEM major not because of lack of success but because of the climate of academic departments that did not facilitate women's participation and progress (Hill, Corbett, & St. Rose, 2010).

Sense of belonging has been noted as an important factor in retention models and has gained momentum in persistence and retention literature. Hurtado & Carter (1997) found that student integration in the academic and social area of the campus environment were critical to their college progression and development, this directly effects their sense of belonging. Goodenow (1993) points out that the need to belong in an educational setting reflects "the extent to which students feel personally accepted, respected, included, and supported in the school social environment" (p.80). The concept of belonging becomes key to an individual's self-worth as well as feeling that their efforts are valued, both of which influence persistence and academic success in college

(Strayhorn, 2012). Institutional acceptance of social and cultural practices of the student will determine if the student fits in. If the student's social and cultural practices are rejected, the student maybe motivated to leave the institution or major department (Thomas, 2002). The decisions a student makes about their experiences and sense of belonging can lead them to decide which activities to pursue, how much effort to give, or how determined they will be able to continue through to graduation when challenged (Strayhorn, 2012).

In Bourdieu & Wacquant (1992) the French Sociologist Pierre Bourdieu used the expression "like a fish" to describe a sense of belonging (as cited in Leer, 2008). Bourdieu's research concentrated on how adults in society achieved or failed to achieve social status and success. Perhaps, Bourdieu's metaphor can also be applied to this research study through the experiences of African American and Latina undergraduate women who feel, like "fish" in or out of water depending on their sense of belonging in the science campus community. Agreeing with Bourdieu, Thomas (2002) argues that institutional culture can make students feel like fish in or out of water depending on how the student feels about belonging to the institution. Thomas (2002) refers to students from non-traditional backgrounds that feel different from others and may be uncomfortable at the institution. These particular students might want to leave the institution to return to a more familiar environment where there is greater acceptance. Thomas (2002) argues that non-traditional students arrive on campus lacking a particular cultural capital. These students have a hard time fitting into the institutional habitus, which creates an inherent social and cultural bias within the campus community. This causes non-traditional

students to have a hard time integrating into the institution and leads to poor retention of students in the science disciplines.

Underrepresentation of Women in STEM

According to the National Science Foundation (NSF), African American women and girls make up 6% of the total United States population, account for 14% of female students enrolled at four-year institutions, and 10.4% of female graduate enrollment in STEM (NSF, 2013). Latina women and girls make up 8% of the total U.S. population, account for 16% of female students enrolled at four-year institutions, and 12% of female graduate enrollment in STEM (NSF, 2013). Even though the overall population of minority women is increasing, low numbers of underrepresented women are entering scientific fields because of the lack of undergraduates being retained at the higher education level.

Scholars continue to study factors that explain why African American and Latina women continue to be underrepresented in undergraduate science disciplines at the college level and in science career fields (Sax, 1994; Seymour & Hewitt, 1997; Ost, 2010; Espinosa, 2011). The research literature offers insight into the phenomenon and point to issues of campus climate, poor degree completion, academic preparation, early career aspirations, faculty interactions, gender inequality, lack of mentors and role models, as well as ethnicity and socioeconomic status (Tinto, 1997; Bonous-Hammarth, 2000; Huang, Taddese, & Walter, 2000; Johnson, 2007; Chang, Cerna, Han & Saenez, 2008; Trenor, et al. 2008; Espinosa, 2009; Maltese and Tai, 2011).

Given the need to diversify and promote innovation in the science career field, studies have attempted to identify and find ways to encourage women and minorities to

choose science majors and subsequent careers in the science (Springer, Stanne & Donovan, 1999; Villarejo & Barlow, 2007). In a study done by Springer, et. al. (1999) researchers studied the effects of participation in small group learning on STEM undergraduates. They found that learning in small groups significantly raised college student's achievement in math and science. In another study, Villarejo & Barlow (2007) found that underrepresented minority students persist at a higher rate in the science major when out-of-class support programs are provided. In this study, supplemental instruction served as a support for minority students at the institution. Both of these studies have been cited in research focused on increasing STEM persistence and solidifying interests in STEM careers. However, more must be done to increase the numbers of minority undergraduate women who persist in the science discipline and continue on in the science career field.

Chang, Sharkness, Hurtado, & Newman (2014) argued that institutions of higher education play a large role in increasing the participation of underrepresented minority students in STEM related career fields. Structural barriers that prevent these women from leaving the science major must be removed (Brush, 1991). With all the effort that is placed on recruiting these women to institutions of higher education there must be an equal amount of effort and motivation used to encourage them to stay in the science discipline (Brush, 1991). Institutions that create an atmosphere that highlights science skill and ability will be successful at recruiting and retaining women of color (Johnson, Brown, Carlone, & Cuevas, 2011). This approach has the potential to motivate and enhance student participation in the science classroom.

A study done by Seymour & Hewitt (1997) reported that women are just as interested as men in majoring in STEM however, something derails their aspirations early on at post-secondary institutions. Seymour & Hewitt (1997) found that some science and math introductory courses have a highly competitive environment that may discourage students from continuing with more advanced coursework in STEM majors. In their study they found that women gained confidence in their skills when faculty responded positively to female students. Tobias (1990) found that women characterized the college science classroom as an unfriendly place. She argued that introductory courses weed out all but top-tier students (Tobias, 1990). Common themes among the literature include a self-defeating perception that STEM is too difficult (Ost, 2010), a lack of role models and mentors (Blickenstaff, 2005), discouraging academic environments (Rask, 2010; Fox, Sonnert, & Nikiforova, 2011), and lack of belonging (Hurtado & Carter, 1997).

The majority of these studies have relied heavily on the use of quantitative research using longitudinal data from large research projects to understand the reasons why women are less likely to persist in STEM undergraduate majors (Bonous-Harnmarth, 2000; Chen, 2009; Nunez, 2009; Chang, Sharkness, Newman & Hurtado, 2010; Griffith, 2010; Espinosa, 2011). A qualitative approach on African American and Latina undergraduate women sets the stage for understanding the experiences of the participants and provide insights about belonging. This study gives a voice to African American and Latina undergraduate women to discuss their sense of belonging in the science campus community. As being close to others and fitting in is commonly associated with a greater sense of belonging. The research expands upon the concept of belonging and brings to the forefront their feelings of connectedness. By adding to the literature, this research

sheds light on how educators can better engage these women to pursue degrees in science. Additionally, a qualitative focus allows the researcher to understand the feelings, behaviors, values, and perceptions of African American and Latina women in the science campus community.

Statement of Purpose

The purpose of this qualitative study was to explore the sense of belonging of underrepresented African American and Latina undergraduate women in science majors at a large northeastern public research institution. This setting was chosen because it represents a large population of women in the science discipline. Also, the institution is a major research university that awards a large amount of bachelor's degrees in science each year. This research study will give a detailed understanding about their cohesion and fit in the science campus community as well as experiences that describe their sense of belonging at the higher education level. Throughout this research study, sense of belonging is positioned as a framework for understanding the experiences and the motivation of African American and Latina undergraduate women studying in a science major. Sense of belonging was chosen because it refers to the way an individual relates to others and the environment (Hagerty, et. al 1992). Additionally, studying sense of belonging helps the researcher to understand how individuals express feelings of connectedness to a group or an environment. Belonging is fundamental to any student's well-being and happiness. It is most expressed, as a positive feeling however, there is another side where students lack a sense of belonging or feel separated from the larger community (Tinto, 1987). Moreover, studying sense of belonging would help to show

that the higher education community is responsible for ensuring the connectedness of students to campus and their undergraduate departments.

This study also examined how the institution promoted or hindered the success of African American and Latina undergraduate women in the science discipline through narratives. These narrative stories provided a backdrop for the participants to make meaning of the experiences that transpired in their lives. The narratives included stories of motivation, confidence, fear, rejection, triumph and empowerment.

Such information could prove invaluable in providing strategies to create campus climates of diversity, inclusion, and retention for African American and Latina undergraduate women in higher education as well as encourage women to pursue careers in the science field. Researching the belonging, cohesion and fit of African American and Latina undergraduate women provided insight into the lived experiences for both groups of individuals in the science campus community. The experiences of African American and Latina women in the sciences should not be ignored, as it is a male dominated area where women often receive messages from faculty and peers that they do not belong (Johnson, 2007; Smith, Lewis, Hawthorne & Hodges, 2013; Hazari, Sadler & Sonnert, 2013).

Research Questions

The following research questions guided this study:

1. How did African American and Latina undergraduate women describe their sense of belonging as it related to their academic and social experience in the science campus community?

2. What factors contributed to African American and Latina women being engaged or disengaged in their science campus community?
3. How does ethnicity and gender influence their sense of belonging in the science campus community?

Significance of the Study

At no time in history has improving the underrepresentation of women in science been more important than it is today, it is well documented that women and racial minorities are underrepresented in STEM undergraduate degree attainment and in the science careers fields (National Science Foundation, 2013). The addition of women and minorities to the science field will help diversify the experiences and perspectives in the scientific community. Espinosa (2011) states, "the need to build a robust STEM workforce for national and regional economic development and job creation holds the attention of policy makers and American people alike" (p. 211). By focusing on undergraduate women who intend to major in science at an urban institution, this study provided insights into the experiences of an important population of postsecondary science students who contribute to the fabric of society in the current higher education system. There is a wealth of literature regarding African American and Latina women in undergraduate science disciplines as well as their experiences in the science classroom and laboratories at institutions of higher education. This research study adds to the higher education literature by focusing on the experiences of these students through their narratives and examination of their motivation to succeed, academic preparation, reasons for college major selection, and their academic and social sense of belonging on campus.

There has been a wealth of research conducted in the past decade that attempted to understand why minority women are underrepresented in the science classrooms at United States colleges and universities (Ware, Steckler, & Leserman, 1985; Seymour & Hewitt, 1997; Hurtado, Cabrera, Lin, Arellano & Espinosa, 2008; Chen, 2009; Espinosa, 2011; Kokkelenberg & Sinha, 2010; Ong, Wright, Espinosa, & Orfield, 2011). Much of the research has been conducted from a longitudinal quantitative perspective and has attempted to examine the barriers surrounding the phenomenon. Throughout the research it has been determined that the daily interactions and experiences of minority women must be encouraged by educators and policy makers because it is critical to the retention and graduation of these undergraduate women in science undergraduate disciplines.

In their study, Olsen & Rioden (2012) gathered information for a national report that provided a strategy for improving STEM education during the first two years of college. The report found that 40% of entering first year college students who intend to earn a STEM degree complete the requirements, and account for only 300,000 STEM graduates each year however, it is projected that there is a demand for approximately one million STEM jobs in the U.S. workforce (Olsen & Rioden, 2012). Their recommendations in this report included, adopting new teaching practices at the undergraduate level, replacing traditional lab courses with discovery centered research, creating a national experiment to address math preparation gap, encouraging businesses and organizations to diversify pathways to STEM careers, and creating a Presidential council to provide suggestions and guidance on post-secondary STEM education (Olsen & Rioden, 2012).

This study examined African American and Latina undergraduate women's perceptions of their experiences at a large urban four-year research institution. The study explores the current research and provides a detailed, rich description of their experiences in the science discipline through the theory of belongingness. The research study examines the experiences of African American and Latina undergraduate women through narratives, including their reasons for choosing the science major, reasons for selecting their current institution, as well as their academic and social integration in the science campus community.

The Carnegie classification describes this institution as a large research institution that enrolls over 37,000 students and less than 15% are African American and Latina women. This research study examined how the institution promotes or hinders the success of these students in the science discipline. The results from this study addressed missing pieces in the literature regarding the experiences of African American and Latino women in the science higher education community. Furthermore, this study encourages policymakers and educators to address and reduce barriers that prevent underrepresented women from pursuing bachelor's degrees in the sciences. It is the researcher's goal to help engage and spark difficult but productive conversations within the higher education community about the perspectives and experiences of African American and Latino undergraduate women in science.

Definition of Terms

Sense of Belonging- refers to the feeling of an individual of whether or not the student feel included in the college community (Hurtado & Carter, 1997).

Science, Technology, Engineering, and Mathematics (STEM)- refers to a curriculum based on the idea of educating students in the Science, Technology, Engineering, and Mathematics these subjects such as Agricultural Sciences, Chemistry, Computer Science, Life/Biological Sciences, Environmental Sciences, Geosciences, Mathematics, and Physics.

Underrepresented Women- refers to those groups whose representation in STEM is less than their representation in the population as a whole (National Science Foundation, 2013). According to the U.S. Census Bureau survey in 2010, African American women were 6%, of the total population of the United States and Latina women also made up 6% of the total population U.S. (Census Bureau, 2010).

Women of Color- This study referred to women of color as African American and Latina women. The term African American is used to describe those individuals being of African descent. The term Latina refers more exclusively to persons or communities of Latin American origin.

Underrepresented Women in STEM- refers to African American, Latina, and Native American women because they are underrepresented in STEM career field and in academia at lower rates than the entire population.

Chapter Summary

The chapter highlighted the problem of undergraduate women in the science discipline and how their sense of belonging affects success in the higher education

science community. As the United States attempts to maintain its competitive position in today's global economy, it is imperative to recruit and retain a steady stream of graduates in the science undergraduate majors. African American and Latina women represent an important population of students in the higher education community; however, this population has the lowest representation of undergraduate science bachelor's degree holders. This study gives a voice to minority undergraduate women to help understand the phenomenon. The research will attempt to the literature and encourages capable and interested minority women in science to persist to graduation by examining their sense of belonging in the science campus community.

Chapter 2

Review of Literature

Much of the research on the factors affecting the sense of belonging of minority students focuses on individual characteristics and experiences. Some of those factors include institutional structures, social integration with faculty and peers, retention and persistence in science disciplines, negative experiences in science courses, engagement and involvement on campus as well as academic motivation. After considering college experiences, research has found that having a connection with academic interactions increases a student's sense of belonging. For example, participation in academic support programs and having interactive conversations with peers outside of the classroom about academic topics and course materials contributes to a stronger sense of belonging (Hurtado & Ponjuan, 2005).

Defining Sense of Belonging

The belonging model originated from the research of Bollen & Hoyle (1990) who argued that perceived cohesion can be seen as "the extent to which group members feel 'stuck to,' or part of, particular social groups" (p. 482). The model consists of an individuals' sense of belonging to a group as well as their sense of self-worth concerning group membership in a particular environment. Currently, there has been a growing body of literature in higher education focused on a students "subjective feelings of connectedness, cohesion or sense of belonging to the institution," (Maetas, Vaquera, Zehr, 2007 p. 239).

The concept of belonging has adopted several terms and definitions by researchers (Anant, 1996; Desi & Ryan, 1991; Hagerty,et al.,1992; Baumeister & Leary,

1995). Strayhorn (2012) defines sense of belonging as the student's perception of affiliation and identification with the university. Anant (1996) termed it belongingness, which involves acknowledgement and acceptance of a membership by other members in a group. Deci & Ryan (1991) defined it as the need to relate to others and the environment. Hagerty, et al., (1992) defined sense of belonging as, "the experience of personal involvement in a system or environment so that persons feel themselves to be an integral part of that system or environment" (p.173). Similarly, Cook, Purdie-Vaughns, Garcia, & Cohen (2012) described it as a feeling of academic fit. In an extensive research study on a large body of literature Baumeister & Leary (1995), argued that the need to belong among human beings is a "fundamental human motivation that is something that all human beings and cultures possess ... to form and maintain at least a minimum quantity of lasting, positive, and significant interpersonal relationships" (p. 497). Additionally, Maslow (1954) described belonging as a basic human need, ranking it third in his hierarchy of human needs. Maslow (1970) posits that the need to belong is a vital prerequisite of human need that must be met before an individual could achieve a sense of self-worth.

Sense of belonging in higher education has been referred to the level in which students felt like they belong in the community and participated in academic and social activities (Hurtado & Carter, 1997; Hoffman, Richard, Morrow, & Salomone, 2003; Hurtado & Ponjuan, 2005; Johnson, Soldner, Leonard, Alvarez, Inkelas, Rowan-Kenyon, & Longerbeam, 2007; Strayhorn, 2012). Although, this concept as Johnson et al., (1997) states, "understanding a students sense of belonging to their campus communities represents yet another way to explore the influence of connectedness on their campus

experiences" (p.527) belonging has been used in few studies on certain groups of college students (Tovar & Simon, 2010), such as women (Ostrove, 2003) African American and Latino students (Hurtado & Carter, 1997; Smedley, Meyers, Harrell, 1993; Nora, Barlow & Crisp, 2006; Maestas, Vaqvera, Zehr, 2007; Nunez, 2009; Strayhorn, 2011; Strayhorn, 2012). Other studies have examined the levels of belonging between White students and minority students in higher education (Han, Sáenz & Espinosa, 2007; Hausmann, Schofield, & Woods, 2007; Locks, Hurtado, Bowman, & Osegura, 2008).

The sense of belonging construct was first introduced in the higher education literature through the research of Hurtado & Carter (1997). They argued that the concept "captures the individual's view of whether he or she feels included in the college community" (p.327). Student success all depends on the fact that the student feels welcomed by the higher education climate and environments (Strayhorn, 2011). While sense of belonging has been understudied in student persistence research, it holds a significant amount of respect in the higher education literature. Recent studies have been conducted to extend the sense of belonging framework to other racial and ethnic groups outside of Latino students. More must be done to explore this sensitive issue because sense of belonging studies at the higher education level has only been explored in limited research studies (Tovar & Simon, 2010; Hausmann, Schofield, & Woods, 2007).

According to the American Council on Education, (1949/1987) belongingness is defined as "relating to a student's sense of adjustment to college and involved finding a role in relation to others which will make him [or her] feel valued, will contribute to his [or her] feeling of self-worth, and will contribute to a feeling of kinship with an increasing number of persons" (as cited in Johnson, 2007 p. 5). In other words, the

individual has an experience of personal involvement in a setting where the person feels like an integral part of that environment. Students' sense of belonging can be gained by becoming involved on campus through social and academic activities (Johnson, 1997). Therefore, studying the sense of belonging in undergraduate women gives researchers the opportunity to learn more about how positive outcomes such as retention and graduation are achieved when students feel like they belong.

Sense of Belonging Among Undergraduate Students

College students' sense of belonging, especially early in their college years, is important for their academic motivation and success in the higher education setting (Freeman, Anderman & Jensen, 2007; Hoffman, Richmond, Marrow & Salomone, 2002). Sense of belonging is determined through the interaction between the student and the institution (Maestas, Vaquera & Zehar, 2007). Hoffman, Richmond, Marrow & Salomone (2002) examined the relationship between sense of belonging and persistence during the first year of college. They found five factors related to sense of belonging: (1) perceived peer support, (2) perceived faculty support/comfort, (3) perceived classroom comfort, (4) perceived isolation, and (5) empathic faculty understanding. In addition, Nora (1996) found that the support of peers, faculty, and advisors reinforced the social integration of students into the college community.

An investigation on school belonging and its influence on college undergraduate populations was conducted by Morrow & Ackerman (2012). These authors used the Sense of Belonging Scale (SBS) to measure belonging and motivation as well as academic attitudes and persistence using a survey question asking about student intention to graduate. The sample consisted of 960 first year undergraduates. The goal of the

research study was to measure the importance of sense of belonging and motivation in predicting intention to persist in college and retention of students from the first to second year of college. In the investigation of motivation and belonging they found that when students "felt connected" via peer and faculty experiences, there was an "intention to persist" (p. 4). Morrow and Ackermann (2012), stated, "How connected students feel to their university is an important construct to consider when looking at why students may or may not persist at an institution" (p. 484). The authors proved that in the end, motivational attitudes resulted in drive to persist toward graduation. The authors concluded that more studies must be done on motivational factors predicting retention because their findings did not produce significant results (Morrow & Ackerman, 2012).

The findings from Hausmann, Schofield, & Woods (2009), Morrow & Ackerman (2012), and Hurtado, Han, Sáenz, Espinosa, Cabrera, & Cerna (2007) suggest that sense of belonging plays a significant role in persistence, and academic motivation among college students. Sense of belonging was found to have a direct and positive effect on commitment to college persistence. Students who integrate into the university community, are more likely to have an enhanced sense of belonging, and are more likely to remain enrolled (Hausmann, Schofield, & Woods, 2009; Morrow & Ackerman, 2012; and Hurtado, Han, Sáenz, Espinosa, Cabrera, & Cerna, 2007).

As retention of students continue to be an major concern for higher education administrators it is important to point out that students must feel like they belong to the community in order to achieve their desired academic goals. Sense of belonging is a critical aspect of retention of students particularly minority students at institutions of higher education (Nunez, 2009; Strayhorn, 2012). It has also been described as an

important aspect of the college environment, belonging has a way of predicting success and retention (Freeman, Anderman, and Jensen, 2007). Low persistence of minority undergraduate women in science disciplines is not surprising, given that STEM careers are non-traditional fields for women (Trenor et al., 2008). Therefore, looking at the sense of belonging of African American and Latina women is important for the motivation and encouragement of their success in college.

Retention and Persistence Frameworks Used to Study Minority Students

Belonging is one of many issues minority college students face and is also a major retention concern among scholars. For decades, researchers have cited Vincent Tinto's model on student retention referring to it as the most influential model on student persistence (Goodenow, 1993; Hurtado & Carter, 1997; Johnson et al., 2007; Hausmann et al., 2007; Freeman & Acker, 2007; Strayhorn, 2008; Tovar & Simon, 2010; Morrow & Ackerman, 2011; Meeuwisse, Severiens, & Born, 2010). In a 2015 search of the popular EBSCO Academic Search Premier database, Tinto's research can be found in over 100,000 articles. This speaks to the level of respect which scholars and educators hold for Tinto's model. Tinto's retention model addresses the adjustment and transition of students in the higher education setting. The model theorizes that students' who become socially engaged into the campus community increase their commitment to the institution and have a better chance of graduating (Tinto, 1975). This engagement is not only related to social and emotional support, it is also associated with greater involvement in learning activities, which promotes successful classroom outcomes (Tinto, 1987).

In a prominent research study Tinto (1987) studied student retention at the higher education level, he emphasized the importance of the social and academic integration of

students into postsecondary education. Tinto's model asserts that students who engage in formal and informal academic and social integration experiences are less likely to leave the institution (Tinto, 1987). Also, these students revise the goals and commitments they entered college with as a result of positive experiences that reinforce commitment to educational pursuits. Tinto's model highlights three groups of variables that represent students' social integration into the college community. (1) Pre-college characteristics, such as, prior educational experiences, skills and abilities and family background, (2) college experiences, such as, students' academic major, academic performance (grade point average), and the amount and quality of student-faculty interactions (3) students' out-of-class experiences, such as, student interactions with peers and participation in extracurricular activities including paid work. These are seen as indicators of students' level of academic integration in the college environment (Tinto, 1987).

Tinto's integration framework (1993) is another commonly referred to model in the literature regarding retention and persistence of students. Integration is also an important construct for understanding the experiences of minority students and how they become engaged on college campuses as well as the unique challenges these students face. Tinto's integration theory believes that integrating students into the college community is vital to retention. Tinto (1993) highlights the need for supportive student communities for minority students, especially those individuals who may have a difficult time transitioning to the college environment. Support for these students would increase their chances of being retained.

Tinto posits that integration into the college community can occur in two forms, the academic and the social. Academic integration occurs when students build

connections to the intellectual life of college, while social integration occurs when students gain memberships to different social groups outside of the classroom. He stressed to need for students to be integrated in both areas to increase the possibility of persisting in college. Tinto (1993) argued that an inclusive campus must be built, noting that "to be fully effective, college communities, academic and social must be inclusive of all students who enter" (p.187).

Other researchers and practitioners have also used frameworks that address minority student persistence and retention. Astin's (1984,1999) model of student involvement helps explain how students develop during the college experience. The model includes three components which effect a student's continued involvement in higher education: (1) student demographics and prior experiences, (2) environment including the experiences a student faces during college, (3) student characteristics including knowledge, attitudes and beliefs after college (Astin, 1984). Student involvement refers to the level of physical and psychological energy students devoted to their academic experience.

Astin (1999) argues that behavioral aspects to student involvement are critical. The underlying assumptions is that it is all about the behavior of the student that defines and identifies involvement. The model highlights active participation of the student learning experience. In order for student growth to occur, students must be actively engaged in their environment. Astin (1999) encourages both researchers and practitioners to use the theory to guide their investigation of student development. He also encourages college administrators and faculty to use the model when designing effective learning environments to motivate all students to become more involved in the college experience.

Additionally, Pascarella & Terenzini's (2005) model of student engagement also highlight the retention issues minority students' face in higher education. Pascarella & Terenzini (2005) found that institutions that developed structured programs for minority student's experienced higher levels of student retention than institutions that do not provide these types of programs. Student support programs such as new student orientations, first year seminars, and academic and social programs are essential to the success of minority students (Pascarella & Terenzini, 2005). Supportive individuals are also critical to student success, whether friends, family members, or college staff members. The researchers found that faculty members also play an important role in the success of students at the institution (Pascarella & Terenzini, 2005).

The frameworks of Tinto, Astin, Pascarella and Terenzini all address issues experienced by minority students in the higher education community. These frameworks offer a wealth of information to address and guide college students. These researchers offered a variety of concepts such as persistence, faculty-students relationships, retention, academic achievement, career aspirations, engagement, student satisfaction, integration, and mentoring. Collectively these frameworks highlight the need to transform institutional practices to better understand the social and academic experiences of minority students on campus.

Campus Climate for Undergraduate Science Minorities

Blickenstaff (2005) investigated why women are underrepresented in science through a literature review where he identified a number of explanations for women's exit. The researcher emphasized a historical issue in higher education for women, calling it the "chilly climate" (Blickenstaff, 2005; Vaccaro, 2010). The chilly climate hinders the

success of undergraduate minority women in science (Strayhorn, 2011). A pivotal aspect that Blickenstaff (2005) highlighted in his research is "…the chilly climate in science classes that favors male students" (p. 383). He acknowledged that the problem of women being underrepresented in the STEM majors and career field is not a simple problem that should be taken lightly. He called it a "complex problem" that will take various solutions and time to solve (p. 384).

Other studies looked at persistence of undergraduate minority women in STEM. Espinosa (2011) researched why female minority students are less likely to persist in the STEM major. In her research Espinosa (2011) focuses on the lived experiences of minority female students who attended highly selective, elite, and private large tier-one research institutions. She found that these institutions are some of the best in the country when it comes to preparing future students to advance in the STEM field. However, at these institutions minority females are less likely to persist because of a cultural environment that values research over teaching (Espinosa, 2011). Also, Rask (2010) found that grades had a significant impact on persistence depending on the academic department and gender. He argues that higher grades are connected with high persistence rates. The grades given in STEM departments are consistently lower than those given in non-STEM departments (Rask, 2010). He argued that men were less sensitive to grades compared to women who are perceived as being more sensitive. Women were less likely to take a second course in STEM if they received a lower grade in the first course especially in introductory STEM course (Rask, 2010). Espinosa (2011) asserts that this type of environment creates "competitive grading practices to discourage minority female students from persisting in the STEM major" (p.4). Introductory courses in STEM majors

were found to have some of the lowest grades on campus (Rask, 2010). Rask (2010) concludes, "If grading distributions in STEM departments were brought more in line with non-STEM departments it would also have an important positive influence on the attrition rates that STEM departments experience" (p.12), especially for minority women. In order to fully understand the factors involved in belonging, it is important to understand the factors associated with the campus climate in the higher education environment.

Despite gains in access to higher education the chilly climate factor still exists especially for minority women on campus (Vaccaro, 2010). In a study by Hurtado, Han, Sáenz, Espinosa, Cabrera, & Cerna, (2007), the researchers found that perceptions of hostile racial climates were negatively associated with the sense of belonging of all students, whereas such climates hindered the academic adjustment of underrepresented minorities (URM) Black and Latino students. URM science students were most strongly affected by such concerns, which further inhibited both their academic and social adjustment.

Campus climate can provide an environment where undergraduate minority women experience challenges to belonging (Johnson, 2007). These feelings of not belonging could have a negative impact on learning (Cheryan, Plaut, Davies, & Steele, 2009). Women of color in STEM often report that they feel excluded in the academic environment (Malone & Barabino, 2009; Seymour & Hewitt, 2007). In a research study conducted by Ostrove (2003) she examined 193 undergraduate women attending an elite institution of higher education. The author found that the participants from low and middle class backgrounds reported feeling socially alienated or had a low sense of

belonging while attending college. These women described their experiences as having financial constraints, being academically and socially intimidated or isolated. Ostrove (2003) also found that social class status were significant predictors that determined the sense of belonging and wanting of undergraduate women while attending college.

Another study examining how minority students coped while in college was conducted by Smedley, Meyers, & Harrell (1993). These researchers used the stress-coping model to describe the adjustment process of first year African American, Chicano, Latino and Pilipino students at a large predominately White public institution. The authors described how experiences of racism and discrimination on campus led to psychological and sociocultural stressors that created an environment, which prevented minority students from adjusting and fitting into the college. The experiences of racism and alienation are characterized as stressors in adjusting to the institution. Smedley et al. (1993) acknowledged that racial minorities face additional stressors that other groups do not experience. These stressors caused the participants to feel as if they did not belong at the institution.

Additionally, women of color described feeling like the "only one" referring to themselves in science classrooms and laboratories, this student was the only African American student in her classroom. She also described herself as, "a speck of pepper in a sea of salt" (Malone & Barabino, 2009 p. 486). Learning environments and perceived barriers such as belonging explain low persistence rates for women in science (Trenor et al., 2008). Also lack of role models on campus, especially with the low numbers of women, minorities, and women of color in the STEM departments play a role in why minority females are less likely to persist in STEM (Espinosa, 2011; Sax, 1994). Many

institutions of higher education are described as places of “inhospitable academic climates” (Espinosa, 2011 p. 234). Similarly, Hughes (2010) adds that climate is also important when looking at persistence especially for minority female students who have experienced racism within the STEM major. More than half of the participants she interviewed reported that they experienced some form of racism during their time at the university, by other students and faculty in their STEM learning environments. Freeman, Anderman, & Jensen (2007) suggested that college students of different racial/ ethnic backgrounds do experience college climates differently and are impacted by these differently.

Seymour and Hewitt (1997) supports the notion that women are just as interested in STEM majors as men and are negatively influenced by campus climate. In their research study Seymour and Hewitt (1997) spoke with 335 undergraduate students from seven institutions about why they had either stayed in or switched from a science discipline through observations and interviews. The goal of their research was to gain insight into the experiences that strongly influenced a student to stay or leave the STEM majors. The students who stayed in the major were called “persisters” and those that left the major were called “non-persisters”. They found that the difference was not in the participant’s intellectual ability or in high school preparation, but in the individuals ability to tolerate the different aspects of majoring in a science, math or engineering major. “The most common reasons for leaving STEM arise in response to a set of problems experienced by switchers and non-switchers alike” (p. 392). Factors such as classroom instruction, departmental culture, institutional structure, loss of interest in the major, discouragement, and lack of peer support are some of the reasons why women felt

a low sense of belonging which cause them to leave the STEM major (Seymour and Hewitt, 1997).

Ethnicity and Belonging of Minority Students

In her research Griffith (2010) examined the impact ethnicity has on persistence in science. She suggests that while minorities have lower persistence rates than non-minorities, each group reports different factors that influence student decisions. Similarly, Hughes (2010) adds that gender is also important when looking at persistence especially for minority female students who have experienced racism within the STEM major. More than half of the participants she interviewed reported that they experienced some form of racism during their time at the university, by other students and faculty in their STEM learning environments. The participants in this study were able to overcome barriers to persist in the STEM major depending on the level of campus interaction with faculty and mentors (Hughes, 2010). Hurtado & Carter's (1997) noted that an important factor on sense of belonging for Latino students was their perception of supportive racial climates. Hurtado & Carter's (1997) study examined students transition to college and campus racial climates, through surveying sense of belonging among second-and third-year Latino college students, looking at the impact of college on two key outcomes in the first year of college, sense of belonging and academic adjustment. They found that the significance of coursework to students' lives had a positive impact on academic and social adjustment for URMs in the sciences. Although this finding highlights the importance of experiential learning and understanding the application of knowledge for all aspiring scientists, Hurtado, et al. (2007) pointed out that URM's are more highly affected.

The researchers suggested other studies are needed that "might determine whether a high sense of belonging is evident in students with specific college majors or in various fields of study; in classrooms in which faculty require study groups; and in other institutionally based structures, such as living-learning residential programs, that may enhance students' opportunities to discuss course content outside class" (p. 338). Additionally, serving as a tutor to other peers was highly associated with students' sense of belonging in their third year as college students (Hurtado & Carter, 1997).

Research argues that sense of belonging intermediates the relationship between contextual variables of the learning environment, for example, faculty student relationships, classroom goal structures, and self-efficacy beliefs of students (Roeser et al., 1996; Roeser et al., 1998). A recent study by Hausmann, Schofield, & Woods (2009) examined the relationship between sense of belonging, persistence, and academic motivation among college students. They investigated a sample of 220 first year African American and White students to examine the unique roles of sense of belonging in student persistence, while simultaneously looking at other factors that have been shown to predict student persistence. Students were asked to participate in a three-part survey that was administered during their first year at a large, public, predominately white institution of higher education. Hausmann, et al. (2009) studied students' need for belongingness and persistence of first year students in higher education. The authors reveal a number of factors that uncover student's subjective sense of belonging to assist in identifying possible mechanisms to help increase student persistence. Similarly, a study done by Maestas, Vaquera & Zehar (2007) revealed that learning communities, faculty interest in a student's development and utilizing academic support program

contributed to a higher sense of belonging. Hausmann, et al. (2009) also reported that these same factors relate to both African American and White students in their study. They argued that based upon research, factors believed to be comparable or linked to students' subjective sense of belonging are associated with positive educational outcomes such as, GPA, satisfaction, commitment, and persistence. Additionally, their study highlighted the need for institutions of higher education to boost a sense of belonging in African American students, which requires more intensive intervention that specifically targets the concerns or needs of this group. They conclude that the institutions efforts to "increase the sense of belonging of African American college students may need to dispel negative stereotypes and reassure students that they are capable of excelling academically" (p.669).

The Significance of Faculty –Student Interactions and Belonging

Lillis (2012) contended that faculty interactions with students increase student retention. The relationship between faculty and students is a core factor in the sense of belonging concept (Johnson et al., 2007). Contact with faculty members who give the impression that they care is strongly associated with positive academic outcomes in the higher education community (Tinto, 1987). In a study by Lillis (2012), he found that faculty-student interactions that occurred more frequently had a significant impact on a student's decision to stay in college. Additionally, the amount of interaction as well as the quality of interactions between the student and the faculty is important when determining the student's perception of belonging (Lillis, 2012). The frequency of faculty-student interaction can play a pivotal role in higher education retention: 1) students ability to motivate themselves; 2) how they work with others and 3) how they lead others (Lillis,

2012). Social connectedness in the classroom affects the students' perceptions of the instructor and peers (Freeman, et al., 2007). The more warm and supportive a teacher is the more the student develops a sense of belonging and engagement in the class (Freeman, et al., 2007).

Other studies were also conducted on undergraduate women, which found that faculty-student interactions serve as a key factor in a student's sense of belonging and retention in higher education. For example, a qualitative study by Deli-Amen (2011) examining the interaction of students found that close personal interaction can be experienced within the classroom where the faculty members gives students time to get to know one another or work in groups on a project. These interactions were those, "resembling elements of family and friend relationships". The research highlights outside interaction is also very important. Similarly, Tinto (1993) asserts that faculty-student interactions, inside and outside of the classroom, "are central to the process by which students come to judge the degree of congruence between their own intellectual orientation and that which characterizes the life of the institution" (p, 117).

Faculty-student interactions serves as a very important predictor for minority student persistence, this is particularly true in the study of Berger & Milem (1999). The researchers conducted a longitudinal study with a sample of 1,343 first-time freshman students at a highly selective private residential research institution. Berger & Milem (1999) found that faculty involvement during the early stages of a student's arrival on campus is shown to have a positive impact. In this study faculty also played a significant role in the student persistence process, particularly for those students who are having a hard time fitting in or belonging in the campus community. Berger & Milem (1999)

argue that faculty may indeed be helping students who may not otherwise persist and be successful. Those students who were not able to connect with faculty had a higher rate of attrition whereas, students who successfully integrated were more likely to persist have a connection to the faculty and campus community. Berger & Milem (1999) also argue that more must be done by institutional leadership to engage students in programming and services during the early stages of the student's arrival on campus. Additionally, Berger & Milem (1999) stressed that institutions must do a better job at providing programs and services that meet the needs of student populations so that they feel as if they belong.

Belonging in Undergraduate Research Programs

Offering undergraduate research programs is a method science departments can utilize to increase the level of belonging of undergraduate women in the science discipline. There have been a variety of intervention programs established by educators and policymakers to help address the underrepresentation issue of minority women in science. Some research has been conducted on the effectiveness of undergraduate research programs. Many of these programs focus on individual research experiences and financial support. For example, Fox, Sonnert, & Nikiforova, (2011) studied the pattern of 48 undergraduate programs that aim to recruit and retain undergraduate women in science and engineering majors. As undergraduate women enter post-secondary education they seek assistance from programs intended to open pathways into scientific fields. These programs exist to mitigate key factors that affect participation and performance of undergraduate women in science and engineering (Fox, Sonnert, & Nikiforova, 2011). It is critical for programs to recognize that they must seek creative activities and not confine themselves to individually oriented programs such as "peer mentoring and social events,"

these type of programs are described as “easy” (p. 609) and activities fail to challenge current institutional arrangements. Fox, Sonnert, & Nikiforova, (2011), further report that other critical ways to improve conditions of programs to assist undergraduate women is to seek coalitions with science and engineering faculty, gain reporting lines that reach higher on the organizational chart and reflect on significant organizational concerns; preferably, the connection between the program and the institutional setting to positively shape environments and outcomes of women in science and engineering.

Villarejo, Barlow, Kogan, and Veazey (2008) also studied the influence of undergraduate research experiences and how those experiences increase the chances of students persist in the sciences. Research participation is usually suggested to junior and senior students in higher education. However, Villarejo, Barlow, Kogan, and Veazey (2008) suggest that undergraduate enrichment experiences be introduced in the freshman and sophomore year of college students. In order to increase the representation of minority students they recommend that research experiences be comprehensive and give students a hands-on approach to the science discipline. Admissions to these research opportunities should not be restricted to just students who are in science discipline, other none science majors should also be selected.

This research builds upon earlier studies, which asserts that academic preparation, faculty interactions, and institutional learning environments impact student major selection and persistence (Griffith, 2010; Seymour and Hewitt, 1997; Hughes, 2010; Espinosa, 2011; Rask, 2010). Also, the literature suggests that further research is needed to examine additional aspects that influence student decisions to leave STEM majors. According to Harper and Quaye (2009) additional services are needed to assist women in

STEM to increase the graduation rate and the demand for global competiveness. Institutions must be willing to modify and enhance current services and increase the sense of belonging of women in STEM.

Chapter Summary

African American and Latina undergraduate women in the science disciplines have a better chance at achieving academic success when the feeling of belonging is experienced. The literature above shows that sense of belonging is linked to positive perceptions of social acceptance and scholastic competence (Freeman, Anderman, & Jensen, 2007). Belonging at the undergraduate level is an important factor for retention and persistence in science of minority women. Tinto's retention model addresses the adjustment and transition of students in the higher education setting, which is important when discussing minority women in science. The model theorizes that students' who become socially engaged into the campus community increase their commitment to the institution and have a better chance of graduating (Tinto, 1975).

Positive faculty interaction serves as an approach to improving the sense of belonging of undergraduate minority students. Providing strategies for social integration serves as another approach for increasing sense of belonging of minority students. The question that has not been addressed in the literature is what specific approach to cohesion and fit increases sense of belonging of minority students.

The research summarized in this literature review suggests that students who have a sense of belonging at their institution are more likely to persist to graduation. For example, sense of belonging was found to have a direct and positive effect on commitment to college and an indirect effect on both intention to persist and on actual

persistence of undergraduate students. Seymour & Hewitt (1997) posits that students are more likely to obtain a STEM degree if institutions are aggressive and purposeful in their efforts to provide institutional support. Also, Hurtado & Carter's (1997) work on belonging found that students who participated in campus activities had a much greater sense of belonging than less active peers. Additionally, Freeman, et al., (2007) argued that specific instructor characteristics such as demonstrating warmth and openness towards students, soliciting student participation during class, and instructor's organization positively impacted student's perception of class level belonging.

The belonging concept examines the cohesion and fit experiences of undergraduate minority women in science at a large urban university. This dissertation addressed some of the questions posed in this review of research and has the potential to contribute to the effort to increase the retention and graduation rates of undergraduate African American and Latina women in science. This study encourages policymakers and educators to address and reduce barriers that prevent underrepresented minority women from pursuing undergraduate degrees in science. Since the belonging framework has been used in few studies on certain groups of college students it is a useful tool for this dissertation.

The literature review is presented in five sections beginning with sense of belonging followed by sections related to the factors associated with belonging in college, persistence and retention, campus climate, faculty interactions and academic research strategies all, which contribute to academic outcomes of undergraduate women in higher education science disciplines. Throughout the literature these aspects

determined that “fitting in” or “sense of belonging” are the key to staying in the science major and persisting to graduation.

Chapter 3

Research Design and Methodology

African American and Latina women are still underrepresented in STEM academic departments throughout campuses across the United States. As the pressing need for STEM professionals increase it is important that minority women are recruited and retained in undergraduate science disciplines. Therefore, sense of belonging is important for African American and Latina women, as it is a predictor of success and retention in STEM.

Purpose Statement

Given the increase need to support African American and Latina undergraduate women's participation in STEM disciplines, the purpose of this study was to describe, interpret and explore, the sense of belonging of these individuals in their science campus community. This research study detailed the experiences of social cohesion and fit that describes African American and Latina undergraduate women sense of belonging in the science campus community at the higher education level. The study also examined how the institution promoted or hindered the success of African American and Latina undergraduate women in science.

Research Questions

The following research questions guided this study:

1. How did African American and Latina undergraduate women describe their sense of belonging as it related to their academic and social experience in the science campus community?

2. What factors contributed to African American and Latina women being engaged or disengaged in their science campus community?
3. How did ethnicity and gender influence their sense of belonging in the science campus community?

Theoretical Framework

This study used Strayhorn's (2012) research on sense of belonging as the theoretical framework. The sense of belonging model is a complex theoretical paradigm with psychological roots (Baumeister & Leary, 2005). The belonging model originated from the work of Bollen & Hoyle (1990) who argued that perceived cohesion can be seen as "the extent to which group members feel 'stuck to,' or part of, particular social groups" (p. 482). The model is comprised of an individuals' sense of belonging to a group as well as their sense of self-worth concerning group membership in a particular environment. Baumeister & Leary (2005) defines the need to belong as, "a pervasive drive to form and maintain at least a minimum quantity of lasting, positive, and significant interpersonal relationships" (p. 497).

Sense of belonging has been noted as an important factor in educational retention models and has gained momentum in the persistence and retention literature. Osterman (2000) argues that belonging is a significant aspect in understanding student performance and behavior. She further states, "the need for relatedness involves the need to feel securely connected with others in the environment and to experience oneself as worthy of love and respect…in essence, then, this need for relatedness is the need to experience belongingness or sense of community" (p. 325).

Hurtado & Carter (1997) notes, "… sense of belonging contains both cognitive and affective elements in that the individual's cognitive evaluation of his or her role in relation to the group results in an effective response" (p. 328). In other words the student gauges her relationship to the group and determines if there is a sense of belonging, which then shows if she feels connected to the group. Sense of belonging is based on several constructs as described by Strayhorn (2012): a) a basic human need and motivation, b) a necessary motive to encourage human behavior, c) an importance in certain context within certain individuals, d) its relation to mattering, e) its relation to social identities, f) its association of positive outcomes, and g) the flexibility and dynamics of perceived belonging which all depends on time and circumstances. Strayhorn (2012) uses Maslow's concepts and applies them to college students. He stated that 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, and important to the group" (p. 18). Similarly, Tovar & Simon (2010) argued that sense of belonging is connected to "an individual's sense of identification or positioning in relation to a group to the college community, which may yield an effective response" (p. 200).

Hurtado & Carter (1997) argued that sense of belonging is essential to individuals who "perceive themselves as marginal to the main stream life [of college]" (p.324). This study addressed a group of undergraduate women who, in many ways, exist at the margins. In his research Strayhorn (2012) introduced the concept of normative congruence and applied this theory to marginalized students of color in higher education. Normative congruence simply refers to students who look for environments that are

compatible with their personal expectations, values, and attitudes (Strayhorn, 2010). Using this construct, students who experience normative congruence in welcoming environments are more likely to experience a sense of belonging in that environment. However, when students do not experience normative congruence or when they feel isolated from academic communities of the institution, they are more likely to leave the institution (Braxton & Lien, 2000). This is also consistent with the research of Feldman, Smart & Ethington (1999) who also suggested that congruence between the student and the environment are critical to the student's success. They argued, "Congruence of person and environment is related to higher levels of educational stability, satisfaction, and achievement" (Feldman et al., p. 643). African American and Latina women are underrepresented in science because many experience obstacles to build a social cohesive environment and feelings of belongingness in the science community (Seymour & Hewitt, 1997). These undergraduate women are looking for a way to change the current landscape through their attendance and experiences at colleges and universities to fulfill their dreams of becoming professionals in the science career field.

The researcher chose to utilize Strayhorn's (2012) theoretical approach to sense of belonging because she found it to be the most inclusive and one of the latest works available on the concept. Sense of belong provides a different aspect into the retention and persistence of African American and Latina undergraduate students in science. Sense of belonging helps to understand and express feelings of connectedness to a group or an environment. Strayhorn integrates the works of several researchers such as: Anant (1966) who studied belonging and its effects on women in the nursing discipline. She found that a diminished sense of belonging is closely related to stress, depression, and other

psychological issues. Baumeister & Leary (1995) theorized that belongingness is a fundamental human motivation. Their research was centered on the healthy development of students in educational settings. Additionally, the research of Goodenow (1993) who studied belongingness in the school environment and its effects on students. As well as other research from Hurtado & Carter who examined the experiences of Latino's and other minority students in higher education. Lastly, the work of Maslow (1987) who theorized that belonging and acceptance were a basic need and that each stage of the hierarchy must be met or an individual, would not be able to focus successfully in life. Strayhorn used the work of these researchers to understand the plight of undergraduate students to bring the belonging phenomenon to the spotlight. The sense of belonging approach facilitates the need to recruit and retain more underrepresented women into science as, "sense of belonging is, a critical aspect in retaining all students and particularly students of color" (Maestas, Vaqvera, Zehr, 2007, p. 238).

Strayhorn's concept of sense of belonging can be further applied to African American and Latina undergraduate women in the higher education community. The experiences of these individual's in the campus community are very important to their sense of belonging as minority women in STEM. Students are more likely to persist in college when they feel a sense of belonging and feel like a valued student by other in the campus community (Feldman, Smart, & Ethington, 1999; Strayhorn, 2012). Depending on the educational setting or environment these experiences can differ considerably. The recent work of Ramsey, Betz, & Sekaquaptewa (2013) revealed the effects of the college environment as particularly meaningful to the sense of belonging and persistence of minority women in STEM.

Ramsey, et al., (2013) examined the academic environment of underrepresented women majoring in STEM at a university in the United States. The researchers compared minority women who perceived their academic environment as welcoming to women in a traditional environment. The goal of the research was to identify factors that made the educational environment feel welcoming. Ramsey et al. (2013) found that educational leaders who promoted the development of resources and social supportive programing for underrepresented women in STEM disciplines helped the women show a strong identification with STEM as well as a stronger sense of belonging on campus.

The objective of this research study was to understand how African American and Latina undergraduate women describe their sense of belonging in the science campus community. This study sought out to determine the factors that contributed to being engaged or disengaged as well as how gender and ethnicity influenced their sense of belonging. Semi-structured interviews, and, focus groups were used in this research study to construct a narrative from each participant. Collecting this information proved invaluable in providing strategies to create campus climates of belonging, inclusion and fit for African American and Latina undergraduate women in higher education. To be able to fully understand the experiences of African American and Latina women in science, it is necessary to analyze and describe the world in which these women live. The use of narratives is essential to this research study, as it allowed participants to describe their experiences in order of events in a meaningful way.

Research Design

The purpose of this qualitative research design is to understand and describe the meaning that participants interviewed make of their experiences (Creswell, 2014). It seeks to gain understanding of how participants make sense of their surroundings and how meaning impacts their behavior. The qualitative approach focuses on the participant's experiences and descriptions of life experiences used to generate knowledge (Creswell, 2014). Since this study seeks to gain a perspective from undergraduate African American and Latina women about their experiences in the science campus community, a qualitative approach was appropriate for this study. Creswell (1998) defines qualitative research as, "an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The research builds a complex and holistic picture, analyzes words, reports detailed views of informants, and, are conducted in a natural setting" (p. 15). Qualitative research methods provide the instruments to understand the complexities minority undergraduate women face in the science higher education community.

In qualitative research, the researcher is the main instrument behind designing, collecting, and analyzing research (Merriam, 1998). Qualitative research is an inquiry approach where the researcher explores a central phenomenon by asking general questions and collects detailed views of participants in the form of images or words. The researcher analyzes and codes the data for description and themes, interprets the meaning of the information drawing on personal reflections and past research. Lastly, the final report is written that includes personal biases, objectivity and a flexible structure (Creswell 2002, p. 58).

Creswell (1998) emphasized several reasons for conducting qualitative research. There are seven reasons for conducting a qualitative research study. First, a qualitative research study is conducted when a problem or issue needs to be explored and the important variables are unknown or theories are not available to explain the behavior of the participants (Creswell, 2014). The underrepresentation of African American and Latina women in science is an issue that needs to be explored and a qualitative approach will allow for the researcher to fully understand the participant's experiences. In qualitative research, "researchers interact with those they study, whether this interaction assumes the form of living with or observing informants…" (Creswell,1994, p. 6). Second, qualitative research should be conducted because of the need to study a group or a population. African American and Latina undergraduate women are a unique population to study because little research has highlighted their experiences in science. By studying this population of students the researcher will be able to add to the limited research on minority women in science.

The third reason is to study individuals in their natural setting. Qualitative research highlights the importance of looking at variables in the natural setting in which they are found (Creswell, 2014). Studying African American and Latina women in the campus setting allowed the researcher to learn about ordinary events and behaviors of the participant without removing them from their environment.

The fourth reason to select a qualitative approach is because of interest in, "writing in a literary way or conducting personal interviews or making up-close observations" (Creswell, 1994 p. 7). Researchers are also given the room to use their creativity in their literary style of writing. The use of narratives in this research study

allowed the researcher to use life stories that describe the personal experiences of African American and Latina women in science. Creswell (2008) argued that narratives help educational researchers establish a close bond with the participants. In this research study narratives helped the "participants feel like sharing their stories are important and that they are being heard" (p. 511). Moreover, Creswell goes on to say, "telling stories is natural part of life, and individuals all have stories about their experiences to tell others. In this way, narrative research captures an everyday, normal form of data that is familiar to individuals" (Creswell, 2008, p. 511). In this study narrative stories are told on behalf participants by using the format narratives of Clandinin & Connelly (2000). This analytical process assisted the researcher in understanding and making sense of being an African American or Latina women in the science campus community.

The fifth reason to choose a qualitative research design is because of insufficient time and resources to spend on extensive data collection in the field and detailed data analysis of text information. The sixth reason is because audiences will accept qualitative research (Creswell, 2014). This audience could be journal editors and readers, faculty committees, or colleagues in the field. Finally, qualitative research designs empower individuals to share their stories and experiences, while establishing a power relationship between researcher and participant (Creswell, 2014).

Maxwell (2005) argued that the strengths of qualitative research come primarily from its inductive approach, its focus on specific situations or people, and having its emphasis on words rather than numbers. Qualitative research questions explore the "how" or "why" to understand the experiences of the participants and the inductive logic that is developing in the topic (Creswell, 1994). Instead of "how many" or "how much"

which are answered by quantitative methods using a deductive form of logic. Deductive reasoning arrives at a specific conclusion based on generalizations. Inductive reasoning takes events and makes generalizations (Creswell, 1994). In a qualitative methodology, "…categories emerge from informants, rather than are identified a priority by the researcher. This emergence provides rich "context-bound" information leading to patterns or theories that help explain a phenomenon" (Creswell, 1994, p. 7).

Narrative Inquiry

Narrative inquiry is a literary form of qualitative research that places a special emphasis on writing (Creswell, 2008). It is the understanding of stories lived and told (Clandinin & Connelly, 2000). Narrative inquiry begins with the experiences as expressed in lived and told stories of individuals. Narratives have illustrated the experiences and endeavors of humans from ancient times (Webster and Mertov, 2007). Narratives express emotions, thoughts, and understandings (Marshall and Rossman, 1999). Narrative inquiry characteristically begins with the researchers autobiographically oriented narrative associated with the research puzzle (Clandinin and Connelly, 2000). The goal of narrative inquiry is to capture the whole story. "Reflecting critically on the stories that we read, hear, live and tell may help us to understand how we can use them more responsibly and creatively and free ourselves from their constraints" (Webster and Mertov, 2007, p. 7).

A narrative is a story that gives the description of a sequence of events to provide a cause (Creswell, 2008). Narratives help develop individual or group identity, encourage, rationalize, reminisce, mobilize, offer perspective, entertain, cope with or make sense of disturbing events (Clandinin and Connelly, 2000). Narratives function in

opposition to elitist scholarly discourses providing a way for marginalized groups to participate in knowledge construction (Canagarajah, 1996). Narratives also give participants the opportunity to express their stories as they see it (Snowden, 2003).

The participant's experiences were written as a narrative, expressing how they described their experiences as an African American or Latina undergraduate student in the science campus community. Narratives assisted the researcher to creating a sense of community while conducting the study. Narratives record the experiences of humans through the construction and reconstruction of personal stories. According to Webster and Mertov (2007) narrative research does not claim to represent the exact truth but it aims for "verisimilitude", the results then take on the appearance of truth or reality. Narrative researchers treat credibility and believability as something that storytellers accomplish.

The researcher used re-storying as a technique for constructing each participant's narrative through the recollection of events and experiences, incorporating the context, which they were situated (Clandinin & Connelly, 2000). In the re-storying piece the participant's voice was placed at the center of the study with verbatim text from the semi-structured interviews. Each semi-structured interview was audio taped with the consent of the participant using an electronic recording device.

In this research study narrative research involved the researcher sitting down with each participant to tell her story. Questions were asked in one-on-one interviews and in focus groups. The researcher began by framing the interview. For example, the statement started like: "I am interested in how African American and Latina undergraduate women describe their sense of belonging. Can you start by telling me why you came to this

university?" It was the researcher's goal to encourage each participant to tell her story. During the interviews, open-ended questions with minimum interruptions using occasional prompts were used to encourage more detail and in specific areas of the interview. The researcher understood the significance of acknowledging that each story really belongs to the participant, however the researcher played an important role in helping develop and structure each narrative (Creswell, 1994).

The Role of the Researcher

The role of the researcher in this current study was that of an interviewer, observer and analyzer. According to Denzin & Lincoln (2003) the researcher is considered the primary instrument of the data collection phase. I interacted and collaborated with the participants, and I gathered data for the research study. In this section, Creswell (1994) suggests that the researcher "includes a statement about past experiences of the researcher that provide familiarity with the topic, the setting, or the informants. These experiences are likely to shape the interpretation of the report" (p.147).

As an educator, African American woman, and first generation college student who came from a low-income family, I understand some of the barriers and lack of opportunities minority women face in higher education. Also, as a college-access professional I have worked with underrepresented women in the science discipline and I understand their plight of trying to emancipate, empower, and liberate themselves through education. As a researcher, I approached this study through an advocacy/participatory paradigm to give voice to marginalized groups of African American and Latina women (Creswell, 2009). The advocacy/participatory approach is focused on change, empowerment and equality (Creswell, 2014). The goal included

transforming educational settings and giving participants a voice (Creswell, 2014). It is my belief that all individuals should have an equal opportunity to major in a chosen discipline of study that he or she chooses. These individuals should also be able to enroll in an institution of higher education and be motivated and encouraged to pursue their college goals. I approached this research study from these personalities and the many experiences from students I have worked with in the last fifteen years of my short career in higher education.

Setting

This narrative research study took place at a large northeastern public research institution. The university has a presence in approximately 21 counties across the state as well as academic and research enterprises around the world. It is a research-intensive university with more than 300 research centers and institutions. During the fall of 2014 the university enrolled over 47, 000 students across the three main campuses. The university offers over 100 undergraduate majors and over 200 graduate programs. The data for the research study was gathered at the flagship campus. This particular campus enrolls over 31,000 students per year, over 15,000 are residents who live on campus. This campus houses 31 schools and colleges with the arts and sciences at the core of the academic realm. The Office of Institutional Research, during the fall 2014 semester, reported a total of 6,400 African American and Latino students and of that 3,538 were African American and Latina women accounting for 23 percent of the overall enrollment of undergraduate women on this particular campus. According to the Institute of Educational Sciences in 2013-2014 this current campus awarded approximately 1,589 bachelor's degrees in Science and Engineering to undergraduate students. Data for this

study was collected during the spring 2015 semester. Data collection took place after obtaining approval from the institutions' research review board.

Sample

A purposeful sampling selection technique was used to gather information to assist the researcher in understanding the phenomenon and the research questions. According to Teddlie & Yu (2009) purposeful selection is the act of selecting individuals because they have experienced the central phenomenon. Criteria for selecting the participants included: 1) undergraduate African American and Latina females with sophomore, junior or senior status; 2) a current science major at the university; 3) must have completed both introductory Biology and Chemistry courses; 4) and a cumulative grade point average of 2.5 or higher. Participants who were selected majored in the following nine science disciplines: Animal Science, Bioenvironmental Engineering, Biological Sciences, Biochemistry, Chemistry, Exercise Science, Marine Biology, Meteorology, and Nutritional Sciences. These individuals could assist the researcher understand the problem and central phenomenon in the study (Creswell, 2013).

The researcher requested data from the Office of Institutional Research. The data received included the e-mail addresses, names, campus affiliation and academic major of over one hundred potential individuals who fit the criteria for the research study. After reviewing the data there were potentially over one hundred participants who fit the criteria for the study. The researcher was in charge of contacting each individual to ensure they meet the criteria for the study. I emailed 102 students inviting them to participate and explained the purpose of the study (See Appendix B).

After ten days, 7 individuals responded to the invitation to participant in the research study. The researcher asked these 7 individuals to refer classmates and friends who meet the criteria for the study. Snowball sampling was also used to gather participants for the study. Frank & Snijders (1994) defines snowball sampling, "as a technique for gathering research subjects through the identification of an initial subject who is used to provide the names of other actors" (p. 53). The snowball approach assisted the researcher in identifying other participants for the study. Belonging can be a sensitive topic where participants may possibly be hesitant to come forward about their experiences, so the researcher thought the snowball approach would work best.

During the next twenty days 15 other individuals contacted the researcher to express interest in participating in the study. In total 22 individuals accepted the invitation, the other 80 individuals declined to participate or did not respond. The non-responding students were treated as negative responses. Of the 22 who agreed to participate 20 participants followed through and were present for interviews and focus groups. 2 individuals were considered no shows, as they did not show up for the interview. From this the researcher selected 20 participants who met the criteria outlined above. A second round of emails were sent to all students confirming their participation, details of the proposed study, consent information, meeting time, and locations.

Data Collection

The data collected for this research study was collected from March 23, 2015 through May 1, 2015. The researcher systematically collected data through multiple methods to build an in-depth experience of the phenomenon through semi-structured interviews and focus groups (Creswell, 2007). The semi-structured interviews and focus

groups and were scheduled based on the availability of the student and in a location that was mutually agreed upon by the student and the researcher. The semi-structured interview occurred first. Each interview followed the interview protocol, however in no particular order. Intermittent probes and follow-up questions were asked during and after the interview as needed to gain clarity or explanation of information. There were several occurrences where the participant asked for the question to be repeated and/or clarified. After the interview each participant was asked permission to follow up, if any additional information was needed as well as to confirm information during analysis stage. The interviewer contacted each participant once their narratives were completed asking them to review and evaluate the researcher's interpretation and retelling of their narrative.

The researcher held five focus groups, each group met in a different location. There were three different locations. This allowed the participants to select a location that fit their travel schedules. The researcher used four large conference rooms in the library on each campus site. The conference rooms were private rooms that are available for private use. Each focus group started on time and lasted approximately one hour in length. Each focus group followed the same pattern of questions in numerical order as shown in (Appendix A). All students completed a demographic sheet before the focus group session started all information collected was recorded and kept in a file.

For the scope of this qualitative study the data collection process was conducted in two tiers. Data collection occurred simultaneously, one tier informing the other with the research study emerging and evolving as work proceeded. The first tier of data collection was participant in-depth semi-structured interviews. The second tier of data was focus group interviews, where participants gathered to discuss their experiences. To

gain in depth insights into their understandings of a sense of belonging within their relationships throughout the science campus community, the researcher integrated perspectives and methods that assisted her in learning about the student's experiences.

Each participant was asked to sign a consent statement and was given a copy. Each participant was also asked to sign a release form for audiotapes and interview transcripts. The audiotapes and transcripts were kept in a safe and secure location in the researcher's residence until the research was completed. After the research was presented and completed the materials were destroyed. The researcher reviewed the confidential statements with each participant prior to the start of the semi-structured interviews and focus group session to ensure all procedures were followed.

Tier I: Semi-Structured Interviews

Semi-structured interviews were used to gather data from the participants prior to the focus groups being conducted. Morgan (1997) suggests that individual interviews can help refine the focus group discussion protocols, because data from the interviews can help the researcher to better understand "how people [within a given organization or community] think and talk about the topics that the groups will discuss" (p. 22). Additionally, semi-structured interviews produce more detail and authentic accounts of the participant's experiences (Riesmann, 1993).

Eight of the twenty participants were randomly selected to participate in a semi-structured one-on-one interview. The semi-structured interviews were conducted through open-ended conversations that allowed the researcher to gain an in-depth understanding of the participants view points on the topic, attitudes, and perceptions (Patton, 2002). The interviews lasted approximately 60 minutes in length, at the campus library in the large

conference room, which both researcher and participants mutually designated. It was the goal of the researcher to gain their personal stories, perceptions and experiences regarding being a science major and feeling a sense of belonging at the university.

The semi-structured interviews followed an open and informal interview style using an interview protocol that assisted the researcher during the interview. Depending on the flow of the discussion there was no specific order of how the questions were asked by the researcher. The researcher asked probing questions to clarify points and encourage more explanation. Open-ended questions such as "tell me more about…" and "how did it make you feel?" were used to encourage further communication. The semi-structured style allowed participants to tell their stories and provide details about their experiences. The interviews gave the researcher a chance to clarify any information that was unclear or needed further explanation. It was the goal of the researcher to create an informal, friendly atmosphere, and a natural flow of ideas and opinions. The researcher behaved as the moderator guiding the participants from one idea to another.

Tier II: Focus Groups

A focus group is an active group discussion used to gather information (Creswell, 2014). Patton (1990) notes that a potential benefit of the use of focus groups is a reduction in the likelihood of extreme answers or false responses because participants serve as checks on each other's contributions. Focus groups also generate a wealth of detailed information. Morgan (1997) argues that a key advantage of conducting focus groups is that issues and patterns often emerge as a result of the interaction between focus group participants that would not develop in individual interviews.

In this research study five sets of focus group interviews were conducted in the second tier of the data collection process using the same set of questions each meeting. Twenty participants were separated into five groups, this allowed for smaller groups so that all had a chance to participate (Morgan, 1998). There were four participants in each meeting. The focus group included all interested participants who were invited to attend one of five meetings. The participants were informed that this project would help the researcher learn more about African American and Latina undergraduate women in science disciplines. Additionally, participants were informed that their participation would assist the researcher as an administrator in understanding the support services students need to persist in science disciplines through to graduation. Participants were also told that their participation is voluntary and in no way would effect the student's enrollment at the university (Seidman, 1998). They were informed that completion of the focus group would take no longer than sixty minutes and that all responses were confidential and used only for the purposes of the study. Lastly, the researcher informed the students that their names would not be used in the study, pseudonyms are used as a substitute for each participant (Seidman, 1998). All twenty participants agreed to participate in the research study after being properly informed about the specifics and details of the process. Each focus group was audio taped with the consent of the participant using an electronic recording device.

Data Analysis

Qualitative data analysis is the process of explaining, understanding, and interpreting the experiences of the participants in the study (Creswell, 2012). The process includes examining and making meaning of the data. In this study, the data analysis for

the focus groups used the recommendations of Creswell (2012), who recommends organizing the data, characterizing the data into themes through coding, summarizing the codes, and lastly, representing the data in discussion. Using a qualitative method of coding and categorizing, the data was analyzed during and after data collection.

Narrative analysis was also used in this study. Narrative analysis is a process used by researchers to explore how individuals remember, structure, and story their experiences (Esin, 2011). The focus of narrative analysis is to re-story people's individual experiences through reorganizing and interpreting those experiences in relation to their particular social, cultural, and political context (Creswell, 2007).

The data analysis of the narratives began with the researcher reading and re-reading the interview transcripts. The researcher highlighted events and words that represented examples of the phenomena. To generate the best interpretation of the phenomenon the use of the hermeneutic circle of understanding was applied. Using the hermeneutic circle described by Packer & Addison (1989a, 1989b), which focuses on interpretations of narratives, to understand what the interview data means.

The use of hermeneutic circle of understanding included observing the data, interpreting, reviewing through the new interpretations, and revising, leading the researcher to a deeper understanding of the participant's experiences (Packer & Addison 1989a, 1989b). The process also included constantly going back to the text to bring the researcher to a deeper understanding and reflection to make sense of the whole text (Laverty, 2008).

At the same time, the narrative analysis focused on the personal and social constructs, as they occur in specific places or sequences of places (Clandinin & Connelly,

2000). Data was analyzed from the participant's perspective using "textual matters or the syntactic and semantic devices internally connecting parts of the text" (Mishler, 1986 as cited in Sandelowski, 1991 p.162) to create a narrative of experiences. Using a collaborative approach after the narratives were written, each participant was asked to evaluate the researcher's interpretation and retelling of their narrative for credibility and trustworthiness (Connelly & Clandinin, 1998). The researcher's interpretations derived from the perceptions, experiences, and conversations with the participants. The purpose of the interpretation section, "is to deepen the readers understanding of meaning conveyed in the story" (Polkinghorn, 2007 p.483).

This research study also used the thematic analysis approach to explore the topics and themes that surfaced from the story's content told by the participants. Braun and Clarke (2006) define thematic analysis as, "A method for identifying, analyzing and reporting patterns within data" (p. 79). The participant's stories were treated as data to create themes that illuminated the content across the narratives (Ellis, 2004).

Coding

The researcher was responsible for coding the initial data. A participant was enlisted as a second reader and coder to flag themes. Member checking was used to verify the findings and themes of the study (Lincoln & Guba, 1985). The participants were given transcripts of the focus groups and interviews, the findings and theme analysis of the data. Categories and codes were created based upon the literature review (i.e. gender, ethnicity, sense of belonging, chilly climate, and faculty interactions category were created). Other categories were created from the interview protocol while; additional categories emerged from the data. Using sentence coding (Corbin & Strauss,

1998) the researcher read each sentence and looked for major themes or ideas from the sentences. The steps included: (1) reading and rereading through interview and focus group transcripts and making initial edits; (2) coding the data by highlighting and labeling the text; (3) using codes to develop themes by combining related codes together; (4) connecting consistent themes; and, (5) creating a narrative (Creswell, 2013). Ryan & Bernard (2003) describes this part of the process as cutting and sorting to organize key words or expressions into groups to build links or identify how things fit together. From this, a list of codes, themes common patterns were generated to explore further in the research.

Themes are patterns found in the data (Ryan & Bernard, 2003). They are important to the issue and related to the research questions (Creswell, 2013). The researcher looked for common themes, and while there could be many, Ryan & Bernard (2003) suggest, "more is better" (p.103). It was the researcher's goal to search for themes that help understand what the participants were speaking about. The researcher identified techniques, which were instrumental in assistance of finding themes of words: Key-words-in-context (KWIC) and repetitions. The (KWIC) technique allowed the researcher to identify key words and search the text to find all occurrences of the word or phrase (Ryan & Bernard, 2003). The repetitions technique involved looking for words, phrases, or issues that occurred and reoccurred in the data (Ryan & Bernard, 2003). Using thematic organization the data analysis focused on revealing aspects of how participants made sense of their lived experiences (Riessman, 2000). After final codes, themes, and subcategories were developed the researcher examined relationships between them in order to generate findings.

Ethical Considerations

As minority undergraduate women are underrepresented in the sciences educational leaders and policy makers must address this issue. This phenomenon impedes the goal of the United States to create a diverse workforce to compete in a global economy and preserve worldwide economic development. According to Brooks & Normore (2010) educational leaders are charged with becoming economically literate and pedagogical literate. Economic Literacy refers to "educating and preparing students to thrive" (p. 57). It was my goal through this research to help undergraduate students majoring in science to become more competitive in this global economy by encouraging and supporting them to pursue degrees in science, specifically African American and Latina women. Pedagogical Literacy refers to the ability to read, understand, and criticize documents and other information (Brooks & Normore, 2010). It is the job of educational leaders to make sure the pathways to obtaining a science degree are clear. Through this research it was my goal to continuously research and take a critical review of literature that informs discourse regarding student persistence in science.

Ensuring Trustworthiness

This section discusses the qualitative constructs of establishing, credibility, transferability, dependability, and confirmability. Janesick (1994) argued, "descriptions of persons, places, and events have been the cornerstone of qualitative research" (p. 216), also "becoming immersed in a study requires passion: passion for people, passion for communication, and passion for understanding people. This is the contribution of qualitative research, and it can only enhance educational and human services practice" (p.

216). A variety of strategies used in this research study are provided to show the findings that emerged from the data.

Establishing Creditability

Credibility involves establishing that the results of qualitative research are believable from the viewpoint of the participants in the research to convincingly rule out alternative explanations (Tracy, 2010; Whittemore, Chase, & Mandle, 2001). Miles & Huberman (1994) defined creditability as "truth value" whether the findings make sense to those studying and to those who read the study" (as cited in Toma, 2011). Credibility is determined by thoroughly assessing findings to the extent that they cohere to what is already known (Curry, 2009). Researchers must provide sufficiently detailed information for determining if findings are applicable or can transfer to another environment. Curry (2009) asserts that credibility allows attention to be paid to rival interpretations and the correspondence between the researcher and respondent's portrayal of respondent experiences.

Establishing Transferability

Transferability is the degree to which research protocols can be transferred or generalized to other settings, contexts, or populations (Marshall & Rossman, 1990). Researchers must provide sufficiently detailed information for determination if findings are applicable or can transfer to another environment. Transferability is the ability to apply research to other settings or groups. The information gathered must be useful to another group in similar situations where research questions or problems are related (Marshall & Rossman, 1990).

Two strategies that were used in this research study to establish transferability

were: 1) use of thick description of data to help assess the similarities within the study (Lincoln & Guba, 1985); 2) triangulation of data sources and methods (Marshall & Rossman, 1999).

Establishing Dependability

According to Miles & Huberman (1994) dependability is defined as "whether the process of study is consistent, reasonability stable over time and across researchers methods" (as cited in Toma, 2011). The dependability can be enhanced by changing data collection or research design, as new findings emerge during the data collection. Dependability refers to the degree to which the researchers account for and/or describe the changing contexts and circumstances during the study (Curry, 2009). Some strategies to ensure dependability in this research study were using the same process with each interview and focus group including: asking the same questions in the same sequence in similar type facilities, and in the same timeline also by clarifying the roles and status of the researcher (Miles & Huberman, 1994).

Establishing Confirmability

Confirmability is the level in which others agree or corroborate with the research findings. Confirmability is described as the process of data being established by someone other than the researcher (Toma, 2011). The concept of confirmability is the qualitative investigator's comparable concern to objectivity. At this stage steps must be taken to help ensure that the findings are the result of the experiences and ideas of the participants, rather than the characteristics and feelings of the researcher. The following strategies were used in this research study to reduce bias: the use of devil's advocate to question

interpretations, development of judgment-free notes and the creation of a system to search for negative and alternative instances (Marshall & Rossman, 1999).

By documenting the process from the start of the study to its conclusion other researchers will be able to replicate this study. To increase the trustworthiness in this study the researcher used the results from the first focus group to help develop and inform the semi-structured interview. Triangulation was illustrated by using the focus group data and interview data to access the sense of belonging of African American and Latina women in science. The interviews allowed the research to further validate key findings. Each participant was given a copy of the transcribed notes from audio recordings enabling them to review detailed interview responses and verify the interpretive accuracy of their interview. Additionally, after the narratives were written each participant was asked to evaluate the researcher's interpretation and retelling of their narrative, as a form of member checking (Miles & Huberman, 1994).

Limitations and Assumptions of the Study

The limitations of this research study determine the restrictions inherent in the study and identify the potential weaknesses (Creswell, 1994). The assumptions of the study provided the researcher's preconceptions of the investigated phenomenon (Creswell, 1998). The following are limitations of the study:

1. This research study is limited to one institution. Only undergraduate students from this institution were invited to participate in the study, which could produce different results if this study was open to other students from a different institution.

2. The research study involved a small sample of participants. There are only twenty participants who participated in the research study, which limited the voice of other individuals who were not a part of the study.
3. The research study only involved African American and Latina undergraduate women which limits the diversity of experiences of White, Asian, Pacific Islander, and American Indian student populations that are represented at the institution.
4. Findings from the study may not be generalizable to other large major research institutions with similar histories and student demographics.
5. The participants volunteered to participate so this may have encouraged the nature of the study to be positive.

The following are Assumptions of the Study:

1. The researcher assumed that the participants had time to devote to the study and make a commitment and give full participation.
2. The researcher assumed that the participants would tell the truth about their stories and experiences.
3. The researcher assumed that the perceptions of the participants will be effectively communicated to me and recorded accurately.

Chapter Summary

This chapter described sense of belonging, which is the conceptual framework of the study. The qualitative methods used in this research were also discussed. The data from the collection process reflects the participant views of their sense of belonging in a science campus community. Two methods of data collection were also discussed, which

are focus groups and semi-structured interviews that were collected from each participant. Lastly, the data analysis, role of the researcher, trustworthiness, and limitations were discussed.

In chapter four, the findings of the research study are presented along with the participant profile, narrative stories with researcher's interpretation and retelling of the participant's narratives. Lastly, the chapter ends with the themes across the narratives and focus group similarities

Chapter 4

Findings

The sense of belonging of African American and Latina undergraduate women provided a backdrop for the researcher to explore their experiences in the science campus community. Having a sense of belonging in an educational setting maybe a stronger predictor of positive academic outcomes for minority students in STEM. Feelings of belongingness has been linked by researchers to high levels of academic achievement for ethnic racial groups such as African American and Latina women (Goodenow, 1993; Hausmann, Sochfield, & Woods, 2007; Hurtado & Carter 1997; Johnson et al., 1997). For these individuals feeling connected to peers and the larger campus community, creates meaningful connections and encourages academic achievement. The purpose of this qualitative study was to describe, interpret and explore the sense of belonging of underrepresented African American and Latina undergraduate women in science disciplines at a large northeastern public research institution.

This chapter represents the narrative text of eight randomly selected participants. The narratives were written by the researcher with the intent to maintain the integrity of the participants. Each interview and focus group was transcribed verbatim to facilitate data analysis and bring the researcher closer to the data. The participant's pseudonym names are used along with a phrase taken from their narrative text for a title. Each participant is introduced using their profile information gained from the individual interviews.

The narrative stories used in this study helped reveal information that was not easily seen on the surface (Mishler, 1995). In other words, the narratives allowed more

detailed and deep meaning to be found in each participant's story. During the course of each narrative the researcher's interpretation was used to develop or clarify the narrative. The goal of interpretation and analysis was to understand the way in which the participants created meaning in their lives through narratives (Connelly & Clandinin, 2000). Using a collaborative approach throughout the research process, the researcher and participants constructed each narrative together (Mishler, 1995). The participants were actively involved as the research unfolded. The use of narrative stories provided the researcher with opportunities to understand the participant's experiences.

The analysis of each narrative follows the corresponding narrative text. This was done to make it easier to determine when the participants are speaking and when the researcher was speaking (Sanelowski, 1998). Each narrative section is closed with a symbolic narrative theme identified by the researcher that summarized the results of the analysis. After the narratives were written each participant was asked to evaluate the researcher's interpretation and retelling of their narrative for credibility and trustworthiness (Connelly & Clandinin, 1998). They were asked, "Does this represent your experience?" All participants provided approval and positive responses to the researcher.

The narrative texts, researcher's understanding and analysis of each narrative answers the research questions guiding this study: (1) How did African American and Latina undergraduate women describe their sense of belonging as it related to their academic and social experience in the science campus community? (2) What factors contributed to African American and Latina women being engaged or disengaged in their

science campus community? (3) How did ethnicity and gender influence their sense of belonging in the science campus community?

The researcher wanted to gain a valuable source of insight and practical information about how the participants described their sense of belonging in the science discipline. The researcher also wanted to reveal information that described and documented the experiences of African American and Latina undergraduates to other students, educators, administrators and a wider audience. Lastly, the researcher wanted to find meaning in the story of each participant's life and experiences.

At the beginning of each interview participants were asked to complete a participant demographic questionnaire (see appendix G). Data from the demographic questionnaire represented a profile of each participant and are listed in Table 4-1. The participant's age ranged from 19- 23 years. The participants were also female students in their second year- fifth year of college. These individuals represented nine different academic majors, and their grade point averages were all above a 2.5 or higher.

Table 1

Participant Profile

Participants Pseudonym	Age	Class Year	GPA	Academic Major
*Jane	19	2nd year	3.3	Animal Science
*Amy	19	2nd year	3.7	Bioenvironmental Engineering
*Macy	19	2nd year	3.8	Biological Science
*Lizzy	20	2nd year	3.5	Biological Science
Sydney	19	2nd year	3.2	Biological Science
Belle	19	2nd year	3.3	Biological Science
Tina	20	2nd year	3.0	Biological Science
*Kelly	20	3rd year	3.2	Exercise Science
Lyn	21	3rd year	2.5	Meteorology
Lauren	20	3rd year	2.8	Marine Biology
Sally	20	3rd year	3.1	Chemistry
Millie	19	3rd year	3.4	Exercise Science
Kathy	20	3rd year	3.0	Bioenvironmental Engineering
Ana	21	3rd year	2.9	Animal Science
*Pamela	21	4th year	3.3	Chemistry
Jody	21	4th year	3.0	Exercise Science
Lily	21	4th year	3.3	Biological Science
Mary	23	5th year	2.7	Biochemistry
*Marie	23	5th year	3.0	Nutritional Science
*Christy	22	5th year	2.9	Nutritional Science

Note. *These are the individuals who participated in the one-on- one interviews

Amy's Story

"I'm Just Floating"

Amy is an African American undergraduate student majoring in Bioenvironmental Engineering. At the time of the interview she was a sophomore student with 88 credits in the major and a grade point average (GPA) of 3.7 after taking the introductory science and math courses in biology, chemistry, analytical physics, and calculus I, II, & III.

Family Influence/Support

Amy began her narrative with excitement as she talked about her influences in science ever since she was a young girl. She started to smile as she talked about her father. She reminisced about puzzles and a globe her father used to help her understand the science behind artifacts and magazines he purchased for her at an early age. Amy explained how she learned more about science from her father when she was a young girl.

> Amy stated, "I've always been into science ever since I was a kid, my dad used to buy me these mats of animals and then he would help me put in cut outs of the puzzle pieces. Yeah… *(smiles)* I had this globe *[uses her arms to form a circle]* he purchased for me because he travelled a lot. So he travelled around the world and he would bring me back different artifacts or cool things that were kind of "sciencey" *(uses her fingers to quote).* He would make me read National Geographic magazines. By the way he still buys them for me. He brings them to campus from time to time. My dad really motivates me he really wants me to write books and be on T.V., talking about global warming and stuff like that. So,

he was one of the people that I actually understood why I like, environmental science. My mom on the other hand she was said, "Why don't you become a nurse?" "Why don't you become a doctor?"

Choosing a College Major

Amy talked about her experience of having immigrant parents who were unable to assist her in the college application process. She made it clear that her parents always expected her to go to college however, financially they were sure they would not be able to assist in paying for her education when she entered college.

Amy stated, "I came here to this university mostly for financial reasons, because when I was in high school my parents said, "we have no money to pay for college, you have to get a scholarship or something…you can go to college *(taping her feet)* but you have to pay for it yourself." I was struggling all throughout high school and get a scholarship to pay for college. So, when I applied to all the schools I wanted to apply to I really wanted to go to another university like I'm actually wearing their shirt, *(laughing)* I did – I really wanted to get into a different university but they didn't give me enough money in scholarships. When I applied to this university, they awarded me a multiple ride. I had other scholarships I applied to that they gave me two others as well. I was like okay, well, and this place is closer to home and I didn't have a car, so this was kind of the most convenient thing for me. Also academics played a role in my decision. I didn't really know what I wanted to study – I knew I wanted to do something in environmental science."

Amy went into detail about her reasons for coming to this university. She decided to come to this particular university was because it was the most economical compared to the other institutions. Once she accepted the offer she researched the different science majors and decided that this was a better choice as far as her major is concerned. Amy voiced excitement about her career goals after graduation. She admitted this institution shows more promise to lead her in the right direction as far as her career goals in science are concerned. She focused on a science major that would allow her to start a career and earn money. Amy articulated her concern for the environment and how important the earth is for the next generation of children. She also gave credit to her high school science teachers who helped her understand science from a different perspective. Once she realized how motivated she was about science she decided to find a major in the discipline.

> Amy stated, "This university has so many Environmental Science programs I read a synopsis of each and Bioenvironmental Engineering was the best. It's a five year program when I graduate I will have a Master's Degree. Looking at the other universities they offered the basic Environmental Science, I didn't think I could really get a job from that or profit from that, so I am here. My ultimate career goal is to work for the Environmental Protection Agency. I definitely want to go to graduate school and hopefully become a professor, teaching environmental science or physics. I want to work with EPA and do field work, doing the science behind all the laws that are being passed, and use my scientific background to help pass laws to regulate environmental things that are going on in the country. During my senior year of high school I took an AP Environmental Science class. I was never really an environmental science person. My teacher in

high school she was so amazing she really got me to thinking, I said, “wow, this world is all we have, all the things that people fight over in this world, the earth that we walk on is basically everything we have all the things we’re fighting for.” I really wanted to preserve the earth, I really wanted to change something in this world, especially in the future because everything that we’re doing right now is kind of destroying what we have in the future for our kids so that kind of really got me into Environmental Science. But prior to that, I was always into science in general. I was always into nature, animals, but I didn’t know the significance behind like the destruction that we’re creating on this earth. The AP teacher showed us this video and one of the pivotal points, for me was watching several different oil companies drill into the earth and spread oil all throughout the water systems. The water in the Midwest was actually catching fire from faucets someone could put a lighter to it and will burst into flames. People were getting sick from that area and no one seemed to care. She showed another movie about wildlife conservation and conservation of forester and these movies and her class really had an impact on me. She helped us see the real world connection between what we are doing and learning in class. It was actual real lift it was several visual presentations with what we do in our everyday lives and how it impacted the environment. I really thought I could make a difference and show other people in urban communities and not just in the Black but the community in general. The environment is not something many people think about. If anything, any movement, any social movement would be like the civil rights and environmental movements or rights’ they go hand in hand. I feel like I want to be that person to

kind of bring the environmental issues into light in the Black community or in urban communities."

Intersections of Race and Gender

As Amy described her experience of being an African American female in science at the university, she expressed concern about her white peers who have not accepted her and have not embraced her as they would other white students. She was concerned that she is usually the only Black student in the classroom. She looked down at her hands and said, "they don't think you are smart enough or serious about the work". She was also the only Black student in her work-study position in the laboratory. Amy found it hard to find partners when there were shared assignments that required group work. She was angered by an experience with an Asian male student who was frustrated to find out that he was left to work with her one day in class. She showed her anger by rolling her eyes when asked to elaborate about the experience. Consequently, she admitted to counting Black faces at the beginning of every semester to find other Black people in the class. As she advanced in the Bioenvironmental Engineering major she saw less people who looked like her. Amy, like many other students wanted to feel a sense of belonging with her peers in the classroom environment.

Amy replied, "It's different *(takes a long pause).* It's different from anything I have ever experienced. I don't feel like – I don't know…I feel like it has its downfalls. Sometimes it's just hard to talk to like people in class. Some people don't think you're serious or some people don't think like you're smart enough. If you're saying smart things in the lecture, they're like "okay, well why is she saying this stuff?" "How does she know all these things?" So I don't know it's

kind of good and bad. I like being unique and being the kind of person with a different background, but also I want to fit in so that the White and Asian people like would accept or embrace me in a way that they would embrace someone that looked exactly like them, or acted exactly like them. Well, basically, like, I don't know, I can give an example *(pauses…rolls her eyes before she speaks).* There was one time in my Mechanics of Solid class, and basically, we were paired. It was like the first day of recitation, and we are supposed to be in, groups of two or groups of three. Me and this Asian guy, we are the only ones left without a group member so we just came together and he was like "Oh no, we don't have enough people." I said, "look, there's another group of two right there." He said, "no, no this isn't right, this isn't right." He kept looking around frantically. I asked, "okay…can we begin to do the actual problem?" He didn't know what he was doing. So, I did the entire experiment, he was looking at me, and he said, "Oh, how do you know all these things?" I said, "It's in the textbook." He said, "Oh, okay." I felt like he was thinking since he was paired up with me, he was doomed to fail. I said to myself, "Wow, that's messed up." … He thought because I was Black I didn't know the work… he was probably thinking, "Oh, she can't be serious"…it was … as if he was about to fail the entire course because he had paired up with me for that one day. Ever since then, he didn't ever looked at me the same. I felt like I had to prove myself … Yeah, I really tried my hardest on that one experiment just to show him I'm not stupid, and I'm actually here to learn…if I want to drop out, I would have dropped out a long time ago."

Sense of Belonging and Fit in the Science Campus Community

Amy indicated that being the only Black student in class was a challenge. Part of her motivation came from experiences that caused her to work hard to show her peers she was capable of successfully completing the work. She stated, “I feel like an outsider”, as she described her classmates as unapproachable. She revealed that White peers in class did not speak to her. She described what it felt like to be in a class where the students are seen as unapproachable. She also expressed mixed feelings about being lonely.

> Amy stated, “In my Dynamics class, there were four Black people in the entire lecture hall. The lecture hall is pretty big. I have a habit of walking into class and counting the Black people, it kind of motivates me but it kind of just saddens me. I often feel like wow sometimes I can’t help it because if you don’t have the right support system in the classroom then you’re most likely not going to pursue something you are interested in. There would be no one in class to talk to about it. So, I feel like, many Black women probably don’t even know about all these things all these majors or we can even possibly do it all these science programs and majors that we can join. I want to show people that Black women can do it too. Most times in class, I am the only Black person and other people are forming like study groups with each other, but no one invites me to the study groups. I have to find another Black student to make a study group. This happened to me in my Calculus 3 class and I was the only black person in my class that regularly showed up for the large lecture. The other two black people in my class would periodically show up to the lectures. I think one student switched his section so I never saw him after the first few weeks. So one lecture I was alone and everyone

around me were forming study groups. I heard them say, “Oh, you’re trying to study today.” I’m like, “Dang, I want to study,” but no one approached me. It’s like I am kind of an outsider. The White male students are unapproachable a lot of them are White males with their own–I feel racist or ignorant connotations toward Black people and they probably feel like I am not–I will not benefit them or help them in any way. They don’t speak to me. So I guess that’s difficult but I found a way to go around forming study groups. I find other Black people from other sections or other Black people that took the class before. I try to make study groups and connections from there. Sometimes, it’s really lonely. No, I don’t know about lonely because I do have other black people to lean on or to help me out but it just makes me question why? “Why is it so serious that the White students in class will not talk to me:” or “why is it so serious that they won’t even approach me?” They don’t even say hello? I don’t understand. So, I don’t know if it makes me feel lonely per se because I am not lonely but it just makes me feel some type of way. I just don’t know how to describe it.”

Amy admitted that she wanted to fit in with other students but is having a hard time with her White and Asian male peers who represent majority of the students in the engineering required courses. She referred to her experience with the PI but does not think that is enough to fit in since it is not an experience inside the classroom. She was seeking to belong inside the classroom with her classmates. Being the only Black person continued to be a struggle for her as she mentioned it several times during the interview. Ultimately, because of her experiences she has become more independent and has found

ways to cope with the situation. She leaned on her mother for advice to deal with feeling like she does not belong.

> Amy stated, "Ok, I don't fit in with the students… the faculty I guess since they are older they are little more accepting they kind of have more knowledge, they do like me. The PI was trying to help me out with the research assistant position so I guess I fit in a little bit. But I still kind of feel like weird because I am not that old…I want to fit in with the students my age who are in class with me. So I don't know. I thought I just fit academically or in my own knowledge. I know what I am doing so I feel like that's where I fit in. I don't think there is anywhere I really fit "fit" *[uses her fingers to make quotes]*. If you think about the demographics of the class I don't think I fit. Where am I going to fit? I am not White and I am not a male. I had conversations with other Black Bio-Environmental Engineers, there is one other guy that I know and he is a senior now but he is graduating next year, he stated, "I don't know, every time I walk into that building I just don't feel like I don't belong". "I feel you", I said. I don't know I am just floating there. I guess I fit kind of in the lab, in the research lab. First, I didn't feel like I fit in because yet again I was the only Black person in many of my classes and I am only a second semester sophomore. I don't know just because they think you are not smart enough doesn't mean you aren't smart enough."

Faculty Interactions

Amy admitted that there were perks to being an African American in the science campus community. Her lab Principal Investigator (PI) likes the work she does. She was offered a position on his research team as a Research Program Assistant because she was

Black and there are not enough minorities in the science field, which is what he stated to her. She smiled as she recanted the conversation one day is the lab. She was pleased that he wanted to assist her with her research goals.

> Amy stated, "…I feel like there are some perks to being the only Black person in many of my classes in this major. The PI from my lab, he actually helped me get into the research program as an assistant next semester because he really wanted to see me do this because I'm the only Black women in the entire building. So he really wanted to see me stay, he wanted to see me excel and get published in a science magazine, he's kind of crazy excited about this. I don't know if I can do all this research he is talking about but he saw something in me being the only Black person in the entire building and I wanted to like learn so that was helpful. He stated, "I really want to help you out because my professor helped me out and he really changed my life so I want to help you and change your life". All I could say was, "okay, I don't know how show my gratitude". I was grateful because I wouldn't have gotten the research opportunity. But I work hard in his lab and I'm always working. I'm doing actual experiments with him in this lab this very semester. That was a perk but other than that it's difficult socially."

Support Systems

Amy identified the value of having a support network on campus. She found a group of Black students, like her who struggled socially in the introductory math and science courses. She credited her foundation in the introductory classes to a program on campus that gave minority students academic assistance in the science and math. She viewed this program as a great support and believed that the minority students along with

the minority staff motivated the students. The support of her peers from the minority science program made a big difference in her motivation. She expressed the joy she felt when meeting with other peers who looked like her in the science major. She was excited to meet other Black women who worked just as hard as she to achieve academic success in the classroom. She became more confident in herself as the semester progressed.

> Amy stated, "you must have someone who you know that is Black or like you, that is doing something in the field because if I didn't have like my black friends in my major I don't know if I would have completed anything. Going into Environmental Engineering my first class I really had hard time. Not being a part of the minority science program first semester freshman year I felt so hopeless, I asked myself, "what am I doing?" I had no one to study with, everyone around me in class were White people who did not speak to me. I had a friend who suggested that I join the minority science program to help with class and meet others minorities who are in science majors. I found more Black people to help you out, they give you free books and I was just fine with that. I joined the next semester and I was like wow this is so much better. I met the other girls that were Black and majoring in science. I was said, "Wow, there are more of us, more people that look like me so if they can do it I can do it too", it was motivating. It definitely helped raise my confidence. The minority science program made me feel like I could do anything. I went there to study hard, with my new friends. We helped and uplifted each other and then we separated and went to class. All these White kids don't know what they are talking about and they look at me like I am stupid because I spit out straight facts about the work. Especially in Calculus 3

when I went to that board and worked out that math problem. All I could say was, "ah yes… I know the work". Yeah, your confidence definitely rises when you have that kind of support group and you have people just helping you every step of the way."

"Give me a Chance"

In analyzing Amy's narrative, the overarching message that came across was "give me a chance". Amy started her narrative with her family background, remembering the influence her father had on her decision to study in the science discipline. Amy's narrative is a testament of how motivated she was when she realized science was the right major for her when she entered college. After reading and rereading her story she goes into great detail about her desire to be included by others in the science campus community. For example, "…I don't know if it makes me feel like lonely per se because I am not lonely but it just makes me feel some type away. I just don't know how to describe it." "Feeling some type of way", is identifying a negative feeling. It is an urban phrase used to describe a negative vibe. It is usually put in place when the individual cannot describe a particular emotion. When she used this phrase it was essentially highlighting that there was a negative feeling associated with her lack of connection and belonging to her peers in the science community but she has not identified it as lonely because she has found others in a related community but not her specific major community.

Amy used the term "floating" to describe her detachment to her major department. She made it clear that she felt different in the lab because the PI took a particular interest in her and has also identified that he does not feel like he fits in his

career field. Amy's sense of belonging developed in the form of having a relationship with the Principal Investigator that noticed her intellectual strengths and capabilities, this is when she acknowledged she no longer feels like she is floating.

The key in analyzing Amy's narrative came with her statement, "…it kind of saddens me." At this moment of the narrative the act of not being included in the science campus community materializes. She was hoping for a community that would embrace her for who she was on the inside however, this had not occurred. She described her classmates as "unapproachable". The act of not being invited to study groups and forming ongoing lab partnerships, to no avail made her experience as she stated, "sad". Again, she exhibited another negative vibe, suggesting feelings of not being included. She eventually revealed her struggle with her inability to talk to or study with her peers in class. She admitted it is difficult to gain support from her peers in the major, the lack of support gave her a low sense of belonging in the science campus community. However, the support she gained from her family, faculty members, Principal Investigator, and students from the minority science program motivated her. She found a place and a set of individuals who embraced her and encouraged her academically and socially. These individuals played an important role in her sense of belonging in the science campus community.

Kelly's Story

"I'm Capable of Succeeding"

Kelly is a Latina undergraduate student majoring in Exercise Science. At the time of the interview she was a junior with 95 credits in the major and a grade point average (GPA) of 3.45 after completing majority of the requirements needed for graduation.

Choosing a College Major

Kelly began her narrative by talking about why she selected science as a major. She was interested in medical school and could not picture herself pursuing a different career outside of becoming a doctor. She referred to her high school teacher who had the most influence on her decision to choose science as a major.

> According to Kelly, "My high school teacher was a Biochemist and he kind of inspired me to try out Biochemistry. I came into college mentally thinking that I wanted to study Biochemistry. I realized it wasn't for me because I hated chemistry, and so I ventured out more and found interest in the Exercise Science major. I was really interested in anatomy courses, physiology more of a human body aspects but Medical school is my ultimate goal. Why I am not too sure it's something that I wanted to pursue since being a little girl and I'm not sure I know why I just don't picture myself doing anything else. I am not a big fan of the Arts so that was completely out of the question. I can't picture myself going into another career."

Intersections of Race and Gender

As Kelly described her experience of being a Latina female in science here at the university, she immediately focused on the challenges she experienced. She voiced her

concern about being a Latina who was passionate about studying a science major. Her lack of role models in the major was of a major concern to her.

> According to Kelly, "Being a Latina in science I feel like many often doubt our ability to succeed which means I have to work twice as hard, not only because I am Hispanic but also because I am female. I am a rising senior and still have not had a Latina professor in my STEM courses which makes my dreams seem a little less attainable. In my opinion, if there were more Latina professors teaching my courses my dream wouldn't seem so distant because they would be living proof that someone like me can succeed in STEM. Unfortunately, I wasn't blessed with that experience and I feel as though I have a lot more to prove than my Caucasian friends. My Latina friends who chose to pursue a non-science education look at me as if I am a genius and wish they could be as smart as me. Their reactions surprise me. I don't believe my success is because I am more intelligent than they are, I just have a passion for what I do and a clear vision of what I want for my future. I believe they are just as capable of succeeding in STEM courses and that the only thing holding them back is this picture that society has painted where Latina's don't pursue such rigorous majors. I have been doing research in the lab and I was shocked to hear how many men believe that women don't do science as well as men do. I spoke with a Latina scientist and she mentioned to me that on the days she did not dress business casual, she was often confused for being a janitor. This all places an enormous amount of stress on me to thrive in a STEM major. The more of us that succeed, the less likely the community as a whole and including Latinas outside of STEM will continue doubting our capabilities. I often

find myself feeling proud because I am a Hispanic woman thriving in the sciences, which should not be the case. My race and gender should not matter. I want to be proud of myself simply because I am in individual succeeding in a challenging major."

Struggle/Challenge

Kelly talked about her relationships with her White female peers who were less likely to help or assist her in class compared to White males who seem more receptive to helping her if she requested their assistance.

According to Kelly, "As far as peers are concerned if you ask Caucasian women for help they are just very vague. They don't have conversations with you about the course work. They stay to themselves. Whereas, the Caucasian males are more willing to help you and elaborate on things. The fewer minorities there are in class it becomes a struggle. I am looking for people I can relate to. I feel like it makes it easier to form a study group. It can be hard to form bonds with others outside of your race. I just feel like it makes it easier to meet that group of friends to study with who look like you. I have never been excluded from a study group, I don't think I put myself in that situation. I don't ask. In my opinion Exercise Science is one of the few majors where there are actually a few more minorities."

Faculty Interactions

Kelly was concerned about approaching faculty for help. She admitted being intimidated by her major faculty members. She would rather study on her own versus approach the faculty and ask for assistance.

When I can't make it on my own, I have had to rely on tutoring. I have asked professors even though I don't like to. I am not really comfortable with it. My biggest challenges being a student I would say is well networking in general, it is a big thing for me. I just have trouble talking to professors or pretty much any superior. I am shy and quiet, I am just not comfortable. This is something I have to get over. I have a fear when it comes to faculty and teachers. I guess because the faculty knows so much more than I do I feel like I get intimidated a bit, nor do I want to seem like I am dumb, you know. I study a lot on my own. These experiences have made me more independent. I guess because of the independence I've always just studied in my apartment or so. I spend most of my time there and I guess that makes me most comfortable. I haven't really felt comfortable in any other building or locations in the science community. I have learned to do things for yourself I mean my advisor is very nice but I don't think she would remember who I am so I don't think like I have that connection with her."

Sense of Belonging in the Science Community

Kelly felt like she fits into the major because she was able to grasp the course work and materials. Moreover, her motivation stemmed from the fact that she felt as a Latina woman she deserved to be a science major. She admitted to having doubts about continuing in the major after failing her Organic Chemistry course. She felt like she was personally doing something wrong. She speaks about her pushing pass her difficult stages so that she can focus on moving forward. She took ownership and associated her personal academic failure to feeling like she did not belong in the major at the time when she

failed the course. However, she was able to return to the classroom and retake the course, which built her confidence and inspired her to stay in the science major.

> According to Kelly, "I feel like I definitely belong in my major I fit the materials and the course work, I really enjoy. I think I fit into a smaller portion of the community but yes. Okay I would say it's just because I am excelling in the science courses. I feel like I can do it so I associate myself with being, like deserving to be in the science majors. Like in lab, anatomy lab, I learned things very quickly and it's just because I am so interested in the materials. It comes pretty easy. I definitely have to work for it. The work comes a lot easier to me than it is to the others this is what makes me stay in the major. I think it is just because I have the goal to attend medical school, so it pushes me to look past all my uncomfortable, positions I maybe in, and so I keep going forward. I had some doubts yeah like the time I failed Organic Chemistry. I failed it the first time around. I studied a lot but I guess you slip in studying right? I feel like I was studying hard just, not the right way, and that's probably why I didn't do well the first time around. But it definitely did make me question if I had what it took to get into medical school and I don't know, it just definitely gave me a lot of doubt the first time around I guess belonging, I guess like I don't know failure makes you feel like I don't belong, like you're doing something wrong."

Self-Motivation

Kelly credited her motivation and persistence in the science major to the fact that her academic requirements are practically fulfilled. She revealed that her connection is

not with the faculty or students, it is about the accomplishments she has achieved in the science campus community.

> According to Kelly, "Its all about just getting closer and closer to my goal and I have noticed that I progressively have been doing better in my courses as each semester goes by, and I think that improvement just pushes me even further, and now with the research program that I got into for the summer I feel like that's a huge motivation. I feel so much closer to my goal… It is what motivates me…yes… So my connection is not with the faculty, my connection is not with students, my connection comes from the fact that I am doing well in the major courses…that's basically it."

"Thriving to Succeed"

The overarching message that emerged from Kelly's narrative was "thriving to succeed". Kelly's experiences of being a Latina women in the science campus community was filled with the desire to advance beyond the stereotyped limits of minority women in science. She voiced frustration yet motivation to progress in an environment where her academic capabilities are most times challenged and devalued. She stressed the need to "work twice as hard as others", to achieve the same goal of pursing a science degree in a rigorous major.

In her narrative Kelly made it clear that she was willing to put forth a great amount of effort despite the social and academic obstacles she confronted in the science campus community. She admitted that she has had doubts about leaving the science campus community however, her passion and clear vision for her future helped her eliminate the struggles and uncomfortable feelings associated with being a Latina in

science. Throughout her narrative Kelly took responsibility for not being able to effectively communicate with her peers and faculty since enrolling in college. She revealed that she gets intimidated and does not want to seem incompetent when asking for assistance. She did not ask for much help, in fact, she admits to studying on her own and staying in her room on campus most times. Kelly did not reach out to others when she was in need of help. She looked from within to continue making progress in the science major, eventually it pays of when she states,"…it's all about getting closer and closer to my goal".

Kelly associated her sense of belonging to the science campus community with her knowledge of academic course work and materials. She believed she deserved to be in the science community as a Latina woman because she was excelling in the classroom. She used her own success as a motivator to continue thriving in the science environment. She stated, "I have noticed that like I progressively have been doing better in my courses as each semester goes by, and I think that improvement just pushes me even further." Kelly was able to keep herself connected rather than let her feelings of disconnect with faculty and peers hinder her advancement. She further stated, "so my connection is not with the faculty, my connection is not with students, my connection comes from the fact that I am doing well in the major courses…that's basically it."

Macy's Story

"I am a Force"

Macy is a 19-year-old African American undergraduate student majoring in Biological Sciences. She has a grade point average (GPA) of 3.86, which she attributes to her hard work. She expressed her love for science, which attracted her to the major. Throughout her narrative she consistently speaks of proving herself to others. Macy communicated her narrative with a very aggressive tone. Several times throughout the interview she pounds her fist into her opposite hand.

Family Influence/Support

Macy started her narrative of being an African American woman in science with her story about why she loves Math and Science. She began with her childhood and quickly jumped to her high school experiences.

> According to Macy, "Growing up when I was little, my parents definitely were very big on education. I remember like my dad teaching me like how to do long division when I was in the first grade. I was doing long division, ended up skipping grades. I was in the first grade for about 2 months and then they moved me up to 2nd grade. So definitely a lot of credit goes to my parents because they were very strong about learning and education. Even though they couldn't help me in terms of the process, so like higher education they were very supportive. When it got a little bit more complicated when I was in high school, I had to go to other resources but they were always stated, "You have to do well in school." Growing up I was a very good at math and science. It started off with math. I studied math constantly because I really excelled at math. When I was in high

school I took physics my freshman year. It didn't really hit me. I just kind of went through the motions of going to high school. But when I took Biology my junior year and with that subject I kind of felt that was the most relevant to me. I was doing all this math but I thought to myself, why would I ever do this in the future? I don't want to be a Mathematician. I can just do math problems and solve these for fun, on the side. When it came to Biology and I actually started paying attention to the sciences it was a subject that made sense to me. I was able to see application in the real world…no other subject made this much sense to me. This is when I found out I was good at science and math. Actually, connecting to my biology and anatomy classes, physics and chemistry is where I found the appreciation to continue loving science."

Intersections of Race and Gender

As Macy described her experience as an African American female in science here at the university, she revealed details about the challenges she encountered in the science campus community. Macy indicated that students in the classroom stereotyped her in a negative way. She was adamant about how she continuously had to prove that she was not a slacker or a freeloader and wanted others to know she could do the work.

According to Macy, "People think I am stupid *(laughing)* and it is so funny because I am that type of a person. I hate group projects. Some people say I like group projects because I can just lay back and let someone else do the work. I actually hate group projects because, I don't want someone else doing the work. I don't want it to be an imbalance of work being done and in usual cases it is usually me doing most of the work. Group projects in my classes give Black

people a stereotype. I hear things like, I am lazy and people think I am stupid. I have to take on more course work and then it gets to a point where now they are taking advantage of me. So it is kind of a lose-lose situation where at first your White classmate's think you are dumb and then you finally prove it to them after doing all of their work. I constantly feel I have to prove myself. I want to at least begin a class where they know that I am, I don't want to say competition but I am not just somebody just sitting in class. I am not a free loader I am going to class to learn. So you get treated unequally regardless and it is really difficult because it makes me mad and I find myself in kind of these awkward situations where I don't know how to say no to others that want help. For example, physics recitation, so I am in physics recitation and we are going over a problem and I am basically like leading the class and after class I am packing up, about to go to work and this White girl basically follows me to work and she asked, "oh will you teach me how to do this?" Keep in mind we have already left class she was at my job and I am basically teaching her the work. But I feel like if I had not spoken up in class she would have never even said hi to me. I love helping people but the way that I felt like she came towards me wasn't for the right reasons. I just kind of felt like you probably thought I was dumb before, and now you realize that I am not. I find myself in those situations a lot and it is really hard to say no to individuals who thought I couldn't do the work in class. Many of these people I just feel like it should be equal and everyone should be given a chance before you write me off and stereotype me."

Macy admitted in her first year she attempted to help others in class to prove that she was smart and that she knew the work. She soon learned that helping others reinforced her knowledge in the classroom but it also caused her to suffer if she was not cautious. She also admitted that she came close to jeopardizing her grade in her science class to prove to others she knew the work. While trying to help others she began to get overwhelmed and her grades started to go down. She admitted to assisting Black students in the minority science group with sincerity however, when it comes others like White peers she had something to prove.

> According to Macy, "So… the minority science group when I teach them it is to help them because we are all on the same playing field as Blacks and Latinos. We all understand each other and we are all I guess victims of the stereotypes. So when I teach them I am there to help them but when it comes to some other White students who approach me for help… yeah I want to help them but I also want to let them know that I am not stupid. So I guess it depends on the group it really does. I mean it is bad to say but sometimes you just have to prove yourself to those that think I don't belong here it is difficult. So I just try to avoid it. I don't know, it is so complicated, it is stressful, like that's the most stressful part like knowing what you are doing but then having to prove that you are not the person that is the free loader. You have proven that now all the free loaders are coming to you. It is really not good, it is really stressful and it happens in all my classes. Every time I go to a new class I scope the area and it is usually very, very few Black and Latino people. But usually when White students first see like a Black female they think that we are the free loaders. I mean some Black females have

given us that bad name. When you try to prove that you are not that freeloader all these other freeloaders that you wouldn't suspect they exist and I have had a bunch of them latch on to me. So I try not to ask those questions out loud anymore even though I am trying to help the whole class when I ask those questions. I don't want people coming towards me in that way because that is a distraction. When you try to help everybody it's like not good. I learned that in my freshman year when I took biology, luckily that was the only class in the first semester of biology where I got an A in the class by the grace of the curve and after that I said I can't let that happen again. I just want the White students in class to know that it's not fair to cross this whole section of Black's and Latino's out just because you think we are dumb. So, it has nothing to do with fitting in not because I want to fit in, I don't want to fit in. I don't want to belong to a group that thinks of me in a negative way. I really could care less, I just want them to know that you thought that I was dumb but I am really not *[pumps her fist into her hand]*. I don't want to blend in with them I prove myself to stick out."

Sense Belonging and Fit in the Science Campus Community

Macy smiled as she explained why she thinks her fit and feelings of belonging come from the faculty in the science campus community versus her peers. She acknowledged that she is in a competitive environment but this does not deter her from excelling in the science courses. She spoke with confidence and was sure of her abilities in the classroom after a faculty member encouraged her to join the Chemistry major. Again, Macy provided her motive for proving herself to others in the classroom.

According to Macy, “I fit in and belong with the faculty, I don’t care about the students. No, I don’t think I want to fit. I kind of just want to stand out. I don’t think no! What I mean in proving myself is, I want to fit with the faculty but I just want to stand out from the students, because if I am blending in with students then the faculty is not going to see me. The faculty are the individuals writing my letters of recommendation letters. Faculty are the individuals who are going to speak on my behalf. So, I am not worried about the students. I prove myself to stick out because what is the point of proving yourself so you could just sit with them? First, I was an outsider who they thought was incapable of doing work. Just recently like last night or yesterday I got an e-mail. I got an award from the chemistry department. I’m not a part of that major. I am a biological science major. I got the award because I am doing so well in Organic Chemistry and the department wants to honor me with an award at the ceremony next Friday. I prove myself so that White students know that I am competition, I am somebody you should watch out for. I’m mostly proving myself because some of these White professors in science they also have their stereotypes, but when you go to the and these professors know your name because you passed their exam with an A grade it makes me like I feel like I belong. I feel like the faculty has accepted that I am a force to be reckoned with. It is a mixture of things… you have to pass the exam with an A grade. On the first exam you prove it and then after that you kind of start talking to them and they start telling you about all these opportunities. My Organic Chemistry professor told me I should switch to a Chemistry major. But for him to say you should major in Chemistry, he at least thinks that I can do the

science major…that made me feel like I am connected to the faculty. He said, "I wouldn't be suggesting this if I didn't feel like you could really do it"…that is how he explained it. It was really nice coming from someone…he is old, he is White…he was speaking to a Black female, first of all a female and then a Black female and he was telling me I should definitely do a Chemistry major and he is basically saying you are very much capable … you are worthy of being in science the field basically. So it was nice coming from him. It makes your learning experience so much better if you know the professor, whereas if you continue to be in the background, when it comes to the time you need to ask questions you won't feel comfortable. So you may as well feel the professor out from the beginning. I feel when you show people that you know stuff and you engage and you listen, you show that you have been listening to him. And when you go to his office hours and you let him know when you ask him about a concept that he spoke about and try to recite it to him he knows that you were really listening. They really take you seriously …being taken seriously… I guess it is a really big aspect of being a Black woman in science".

Support Systems

Macy talked about the support she received from the minority science program on campus and clarifies that it was her confidence and motivation to succeed not the program that provided her with social, emotional, and academic support. She acknowledged that she needed confidence to succeed in college. She needed the confidence to speak up in class and be sure of herself when asking questions for

clarification. The minority science program continued to boost her confidence even when she felt excluded from her peers.

> According to Macy, "During freshman year the minority science program staff took me under their wings but I don't need them to be pushed or motivated to do well, I need their help on selecting the correct courses at the right time. I also need their assistance in completing a successful application process to be admitted to medical school. The program is my main academic resource in the science community. I go to them when it comes to studying and academics. The program makes minority students confident enough to know that we can do the required science and math course work. I don't want to be in a situation where people are doubting me. The minority science program is like the secret society where I don't want people to talk about us in a negative way because this is where many of the minorities go to be successful. The program gives me confidence. Confidence to not feel like I have to fit in but the confidence to not be discouraged when you go into a class and there is only three Black people. They teach confidence to speak out and ask a question even though there is only three Blacks and the other Whites students thinks you are stupid and you are asking a dumb question. The confidence to approach your White professors who at first don't believe in you. I think confidence is key just for success in general. I feel it's the confidence to keep going even though I feel excluded from my White peers."

Faculty Interactions

Macy commented on her faculty interactions that have been beneficial to her success. She attributes her achievement to her being herself and reaching out to faculty even when she knew the work. She indicated that it is possible that she is just a lucky person.

> Macy states, "I had good interactions with the faculty because I am me, *(laughing)* I am good at getting on their good side. I always try to make a really good impression from the beginning. I study real hard to always pass the first exam, especially my in science courses. I go to office hours with the professor. I stay even when they don't seem very welcoming. I just keep asking more questions. I also try to give a few professors exam questions during office hours… they like that especially when it's a good question. I am a thinker I try to think as fast as them. I study a lot and help others so that I know the work."

"I Want to Stand Out"

In analyzing Macy's narrative, the overarching message was "I want to stand out." She wanted to stand out in a positive way. She wanted to show her peers in the science campus community that she was not, "stupid", "lazy", or a "freeloader". These are all negative terms she used throughout her narrative to described how others viewed her. Macy's story expressed a great deal of anger she had experienced in the science campus community. She continuously stated, "…it's a "lose, lose situation where at first they think you're dumb…" This phrase indicated she is in a no win situation where she has choices but none of her choices leads to an advantage. It is almost as if Macy is struggling with a battle which she cannot win, with multiple attempts to be included she

is unable to win the fight.

At several points in her narrative Macy also made it clear she had to prove herself to her peers in the science community, she stated, "…when you finally prove it to them…which I constantly feel like I have to prove myself…" These statements demonstrated how she felt like she had to show her peers that she was smart and she had the capabilities of doing the course work without having to prove herself. In an effort to show her peers that she was smart, she tried to help many of them understand the course work by speaking up in class, asking critical questions during the lecture, and volunteering to stay after class to help others. "I don't know how to say no". Consequently, this takes a toll on her as she becomes overwhelmed with other courses.

Macy's narrative revealed her anger about being an African American women in the science campus community she feels like "… you get treated unequally regardless and it is really difficult because it makes me mad". She felt like she fits in with the students from the minority science program who showed her encouragement and appreciation as she described the program as her academic support network.

Finally, Macy's narrative revealed that as an African American women in science, she wanted to stand out for the right reasons. She found acceptance with the faculty who have acknowledged that she is a smart student. She stated, "I feel like the faculty has accepted me and that I am a force to be reckoned with…" and "…he is basically saying you are very much capable … you are worthy of being in science the field". She believed she made a connection with the faculty, they have affirmed her acceptance in the science campus community.

Jane's Story

"I am Good Enough"

Jane is a Latina undergraduate student majoring in Animal Science. At the time of the interview she was a sophomore student with 60 credits in the major and a grade point average (GPA) of 3.75 after taking the introductory science courses in Biology, Chemistry, and Organic Chemistry.

Family Influence/Support

As the interview started, Jane seemed eager to share her experiences of being a Latina woman in the science campus community. She begun with her family background and her identity as a Latina. She leads with reasons she chose this particular institution of higher education and her mother's inspiration behind wanting her to be a Veterinarian.

> Jane stated, "When I came to college I just did it. I just filled out everything the only thing that I needed help with was my FAFSA because I don't know anything about the financial stuff so my mom, she worked that out for me. I came to this specific university mainly because it was close to home. I didn't want to go out of state because my plan is to go to Veterinarian school. I didn't want to pay out of state tuition. Here the tuition is relatively low compared to other private universities or public universities. Also, because of the animal science curriculum. The university has a farm and I never had farm experience…I felt that would really be a nice thing to have especially large animal experience, going into Veterinarian school. I want to be a wildlife Veterinarian and hopefully move somewhere that has wildlife in their natural habitat. So maybe Africa, I would love to live there but that's really farfetched. If this doesn't work out, I'll try some conservation place here. My mother really liked surrounded us with animals. My

mom used to have five different reptiles and a huge Siberian husky sitting on the couch. We had lizards, hard shell crabs a little bit of everything. I used to have animals come up to me that in the neighborhood because they would be strolling around. She raised me like that and she would always tell me I always wanted you to be a Veterinarian. I never even thought about being a Veterinarian. I wanted to be a teacher when I was younger… she introduced animals to me and living in that environment of her always involving us with animals so she inspired me to be a Veterinarian."

Choosing a College Major

Jane explained why she decided to major in science once she started her college education. She admitted not liking science in high school because she did not feel confident in her learning. She expressed her appreciation for math, which confirmed her idea of being a Veterinarian. Jane voiced concern about her grandmother's decision to question her career goals of becoming a Veterinarian, she would rather Jane to become a medical doctor. During her first semester away at college she recognized that she did not have the support system she needed from her family, to be successful in the Animal Science major.

According to Jane, "When I was in high school I really didn't like science, I liked math. Once I realized how much course work it actually took to be a Veterinarian, I was already starting college. After my first Chemistry course here at the university I actually started liking science because it was taught at a whole different angle than high school. I wasn't really learning anything, but when put in this competitive environment you have no choice not to do the work so it

> opened my eyes … I was interested in it and that's why I am staying with it. There are no doctors in my family. My grandmother loves talking about me in front of her whole family so everyone in my family thinks I want to be a doctor because she doesn't really think that being a Veterinarian is a bigger accomplishment compared to being a medical doctor. Once she said, "take care of me and take care of the family… be a doctor." I don't want to do that…I think it's the support system that you have because in my family my mother as much as she wants me to be a Veterinarian, she still doesn't realize the time required to be successful in science. When I am like home on the weekends, she doesn't realize that I have to study and she tells me, "can't you just… go to supermarket …can you do this…can you go here for me?" She always interrupts my study time that's why I don't like being home but I have to work on the weekends. They don't realize studying for science is a job."

Support Systems

Jane indicated that her support on campus comes in the form of programs for minority students. The minority science program has assisted her in gaining opportunities and resources in science. She spoke of two specific programs that assist minority students that are run by administrators of the university. The programs assisted her in finding an internship at an Animal Clinic. Jane expressed concern over not being able to find a group to study with in the science major community. She has not meet a serious set of students who really want to study and help her this experience has made her depend less on other students for help.

Jane stated, "…Sometimes I think my mother doesn't understand she says you have to work, work, and … get a job and do that and when it comes to study time she is like oh well you know, you can do that later. So it is important to have a support system of individuals who really understand. My mother and family do not really know what I am going through… they don't really have that wrapped around their heads yet. I have to prove to my family that animal science is a legit major and it is just as hard as being a medical doctor because we take the same classes and there are some points where she says just be a doctor or just be a physical therapist or something. So sometimes like I don't get that … support I need from my family members…On campus I visit the minority science program for support. The program definitely helped. They introduced me to two great veterinarians and the internship that I did I mean it was a really great experience. To say the least, one random Saturday I got a call from a Veterinarian and he wanted to have an interview with me and the interview went really well. He asked me a lot of different questions and I got the internship. Yeah I got really lucky because there were people in my position who were also looking for somewhere to do their internship. I just had to use help from administrators or the teachers… that's a huge help because they know everything. I am not too fond of student groups when it comes to academic help. Even when I tried a study group at one point I felt that it was moving really slow. I couldn't wait for one person like to finish a problem, but at the same time I don't want to be that person going to others for help so it is just a weird dynamic trying to find a study group. In Organic Chemistry I tried doing a study group with a few people in my class and I

think it was like the first time it was a little bit different. In Organic Chemistry you need a group because you need to share the information. I tried and it was actually really helpful but going really slow when we met to study together. I do feel it was helpful but after the second meeting people weren't dedicated. It just dissipated and never happened again. I don't like to depend on students to study every day, it would be nice to have but I haven't found a group of people who are strictly in the library to study and have nothing else on their minds but focusing on that. So I am yet to find that I mean I really hope I do once I get into my higher level Animal Science classes. I haven't so that's why I just feel I fit in with the faculty they are all mostly pretty nice."

Intersections of Race and Gender

Jane wanted to reveal that she felt the safest on campus at the farm with the animals. She viewed the department as a competitive and intimidating environment where students are checking to see how others compare. She explained that she has been excluded from study groups so she tried to establish a group with the minorities from the program however many of them left the Animal Science major after the first year. She continuously described her classmates as "they", when asked who "they" are, she referred to White or Asian students.

Jane stated, "I think I feel the safest on campus at the farm because you don't have to impress farm animals, they just come to you, they are okay with your race you are good enough for them. Unlike my fellow Animal Science major students, it is always a competition. So basically we sometimes have conversations where they would ask me questions just to see like if I am on the right track like "have

you taken the class yet?" or "what did you get on the exam?" Just trying to suck information out of you to see how you are doing relative to them. So it's a competition and I see it. It's a mix of women and men. More White and Asian students more like out of 50 people. I'll see maybe about five or six total, two Latino, three Black and then rest White and Asian. I don't know how to feel about it. I just question, "Why don't I see more Latino's and African American's?" so it is mostly a questioning feeling. The Whites and Asians don't include others in their study groups. On the first day of class they established their groups and then the first day of freshman year. I planned to do the same establish my group of Latinos and Black friends into a group but a lot of them leave science to continue on a different major path after the first year. So the further I go in the science major, definitely the less people I recognize."

Sense of Belonging and Fit the Science Campus Community

Jane indicated that her commitment to the major made her feel she believes she fit in the community also because she is almost done with her course work. However, during an advisement session with a faculty member, she was saddened by the comment saying that because she was a minority she would not have to worry about her grade point average (GPA) for Veterinarian School. Jane was saddened by this comment it made her feel disconnected and questioned her sense of belonging in the science community.

Jane stated, "I belong here because I actually sincerely do. I really love the major and I am committed to it. I couldn't see myself doing anything else. The main experience that I had with the faculty member which caused me to question if I really belong was when she told me not to worry about my GPA and that I will do

just fine because I am a minority student and veterinarian schools are more eager to accept a minority just to establish or maintain their demographics, basically saying I am a Latino student. So that kind of made me feel sad like she was like down playing my acceptance. If I do get accepted later on it was because of my ethnicity not my intellectual abilities or my GRE scores. So that was like the main experience and the most recent one that I had they made me feel disconnected but overall I do feel like I fit and I belong."

As Jane's interview came to a close Jane expressed why she felt like every Latino and minority should belong in the science campus community of their choice. She goes back to her culture and speaks of the work ethic she was taught as a child. She believes that studying is one of the easiest things she ever had to do compared to the expectations of her family. She is committed to the classroom and wants her family to be proud of her.

According to Jane, "Yeah I feel like I have to go to veterinarian school. Once you announce this to the world you have to keep your promise. Then my grandmother knows and she has announced it to everyone. I want to accomplish this, I will be the first Veterinarian, the first doctor. There are sometimes where I don't feel connected because I question, I am not good enough? Am I smart enough?" I go through that a lot. When I am focused on my studies I put lots of pressure on myself. I can study the entire day I am just hard on myself. But I feel like I have to be. I feel like Latino's do belong, we should belong. When I was younger I was told, "You have to start being a woman when you are 15." I had a job by 15 and I raised my brother because my mom was working all the time. Having good work ethic in the Hispanic culture taught me to be independent. It made me who I am

today. If I can go through all the troubles and stuff I went through growing up as a young girl, being poor, moving all the time because my mom couldn't find a stable house and the other struggles that I have been through, then I could learn to look at it like studying. I am happy to study. Definitely studying science is easy compared to what I have been through. Studying science is a better experience almost like being productive rather than just like struggling. So going through certain issues in my family empowered me. I feel like I am capable of being successful in science. I like being in this major and I belong here because I have struggled through many things to get into college. I successfully earned good grades in the introductory classes, I belong here. My drive is what makes me fit verses the experiences or the behaviors of others yeah at the end of the day that's all you have is your self-motivation I mean that's it. That's what is keeping me in the major."

"Keep Your Promise"

The overarching message in Jane's narrative was keep your promise. Jane's experience of being a Latina woman in the science campus community is internally connected to her family, who was very important to her. She believed she had to keep her promise of being a Veterinarian to herself, the Latino community and to her family despite how they felt about her majoring in Animal Science. She was saddened by her family's lack of support during times when she needed them most, for example, Jane's declaration of becoming a Veterinarian was not well received by her grandmother who told her to "become a medical doctor or a physical therapist", interestingly enough it was her mother who inspired her to love animals. As Jane detailed the comments, her calm

demeanor changed with a serious facial expression. Jane was concerned because her family did not understand how dedicated she was to her education and the commitment she had shown to her academic major.

Jane was not moved by the lack of support from her peers in the major. She felt like she is represented the Latino community, those who had chosen other majors or individuals who did not get the opportunity to study higher education. She was not overly concerned about not being able to find study groups in the major. However, Jane voiced concerns when a faculty member told her not to worry about her GPA as a Latino undergraduate student because, “they are more eager to accept a minority student”. This encounter caused her to feel disconnected from the science community as her intelligence and academic abilities were being taken for granted.

In keeping her promise, Jane referred to her childhood experiences where she was taught to work hard, she stated, “they are not supporting me but they did teach me to work hard”. She found meaning in her family’s lack of support. She was still able to remain motivated because she had a “great work ethic”. She was also interested in making herself happy despite what her family thought of her decision to study Animal Science. As a Latina in the science campus community Jane believed her sense of belonging came by way of promise she stated, “I actually sincerely… I really love the major and I am committed to it I couldn’t see myself doing anything else…”

Christy's Story

"On My Own"

Christy is an African American undergraduate student majoring in Nutritional Science. At the time of the interview she was a senior with 112 credits in the major and a grade point average (GPA) of 2.75 after taking the required courses needed for graduation.

Family Influence/Support

Christy starts her interview focused on why she came to the university. She reveals her struggle with applying to college without parental assistance. Her experience with the process made her feel like she arrived on campus on her own. Christy describes her experience as being overwhelming as she was expected to have a major interest as well as a career interest immediately upon coming to the institution. She compares herself to other students who may have had assistance from their parents and family members to navigate the college application process and to assist them in selecting a major. She also learned that she had to take remedial classes to prepare for the introductory science courses.

> Christy stated, "Once I got to the university I learned that a lot of people had other people who filled out their college application or even their FAFSA application but I did everything on my own. So, when I came here I didn't have as much knowledge to know how college operates. I wish I had someone in my family who went through the whole process. I needed someone immediately to give me better advice as to what to do. I came here and it's a little bit overwhelming because people kind of expect you to know what you want to do or have a major

real soon. Just getting here I was all by myself. I do believe that God helped me to get here, but I still feel like compared to other college students, I got here on my own when it comes to like filling out college applications, completing the FAFSA, and, searching for scholarship and academic resources. So, I just did it on my own, but if I ever needed like my income tax information or my social security card number, my mom had that prepared. When looking at academics I felt like it wasn't so much about what majors the university offered, because I wasn't sure exactly what I wanted to do. I knew I was safe because I could probably find it in the university. I always had an interest in health, I just didn't know which part of health I wanted to pursue. So, my plan was to major in biology and minor in nutrition. But since I was behind in credits by one year, I decided to major in Nutrition. This allowed me to graduate on time even after taking remedial courses."

Academic Preparation

Christy believed she was at a disadvantage when she came to the university because of her lack of preparation from high school. She faced educational challenges in the science campus community because she was not prepared academically as a first year student in the science major. Her peers in the major were equipped with the skills needed to successfully transition from high school to college in contrast to her abilities that were requiring more skills and much needed resources. She described learning science in college as a new language.

Christy stated, "the science education from my high school overall was weak. Coming to a university where the students are already on top of the science game

made me feel like I was at a disadvantage. Even though I felt comfortable when I was in high school because it wasn't that challenging, but coming here really challenged me. I didn't realize in the beginning that I had so many academic challenges. So, I think admitting that I had these academic challenges gave me a little boost to stay with a science major. Perfect example, during my first year I faithfully I got placed in calculus so my math level was strong, but science background not so much. I had to take chemistry in a large lecture hall with 400 other students. The Chemistry course materials and expectations to learn were nothing like high school. Chemistry is very abstract and is also tough with math, a lot of math. I didn't understand the subject, instead of staying in the course, I withdrew and had to go to an intro chemistry course to prepare myself for the actual general chemistry course. If I'm not prepared with a good science background in chemistry, or in Biology, once I get to the college level courses it is less likely that I will be able to stay in the science major if I am not successfully passing the introductory courses. I came here from high school and I said to myself, "what is this?" I had to learn Chemistry all over like a new language."

Sense of Belonging and Fit in the Science Campus Community

When asked about her connection to the science campus community Christy admitted that she does not a have connection to her major department. She had no relationship with faculty or professionals who could steer her in the right direction as far as her career goals were concerned. She explained that she does not feel like she belongs in the company of her peers unless she has something to contribute. She described her peers as arrogant and competitive as far as grades were concerned. Christy talked about

getting assistance from teaching assistants instead of going to the Professor, particularly in those courses held in large lecture halls. She stated, it is hard to get one on one time with the professor.

> Christy stated, "I don't have any connections with peers in my major. I feel like science students on this campus are arrogant and I feel the grading system made them that way. The students behave with a dog eat dog attitude. For example, I got an exam back from one of my professors but before I even got to see the grade the professor said to me, "you did great what an amazing job." As I was walking to go back to my seat, this girl says to me, "so what did you get?" I didn't know her, and I said to her, "I don't know?" I went back to my seat. I couldn't believe she came up to me in front of the class to ask about my private grade. This is what I mean about being competitive, some of the students, not all of them are like that, but some of them are so dog eat dog. Some of the White students believe they have to be better than all the other students instead of building each other up and encouraging each other to be successful. These students are supposed to be our future doctors and this is how they behave towards each other about grades? So, but that's just an example of peers, some of them not everyone behaves this way. I interacted with the faculty more last semester than I ever have since coming here. I was taking Organic Chemistry which is a very large class and there are approximately four hundred students in the class, and you are competing for time one on one time with the professor that you're not going to get because there are 399 other students. So, instead of going to them for office hours I tried other resources. Most of the time I went to the late night study sessions with the TA's. I

had more encounters with the TA's than the professors. At this point neither faculty nor student makes me feel like I fit in or belong. I don't need them to tell me that I belong or not. It's good to be appreciated by your peers, but for me like I'm still late in the game that I don t need to feel appreciated by peers or professors to feel like I'm going to continue to finish and graduate. As far as the peers are concerned I don't really interact with them to know like if I would feel belonged or not. I have learned from the negative experiences to do it by myself."

Intersections of Race and Gender

Christy discussed why she struggled with feeling like she belonged in the science campus community. She revealed that her self-confidence played a role in accepting the negative stereotypes and perceptions her peers had of her in the science classroom. She was not confident in her academic abilities, which caused her performance in the science classroom to suffer.

According to Christy, "I feel like if I wait to feel like I fit in with my peers then I'll probably be waiting for a while. I had to make myself feel like I belong, and it all comes down to me feeling confident in what I know. If another student can see that I am doing well on the exams, they might want to ask me, "Hey can we study together?" But if not, I wouldn't be included. For example, I experienced this more during group assignments and during lab because in lab you're teamed with a partner. Usually in the lectures like biochemistry some students have a group of friends already so it works out for them. But in the classes like a lab as a Black woman I can sense when my opinion is valued and when it's not. I took physics lab and I had two male partners, two white male partners because of my lack of

confidence in my answers even when my answers was right they never regarded it. Both of them would just say, "Oh" to the answers I provided about the experiment… then later on when the TA says, "oh, this is the correct answer, this is right". Neither of them admitted my answers were correct. I look at my color first before I look at me being women. The two of them thought that because I'm Black that I don't have anything to contribute or that I wasn't smart enough to get the correct answer. I felt ousted by the two of them. I don't know if it was attributed to color, I didn't feel included in completing in the assignment dissecting a pig. I was left with the scraps so I wasn't entrusted with something that dealt with a lot of responsibility so it didn't make me feel good at all." I needed to be more confident in the work. I needed to explain before they would trust me that I knew the work. I don't let it affect me. I just try to be more confident in what I know. When I'm hesitant, I feel like it is easier for my thoughts or my voice to get shut down by my peers in the classroom. When I'm confident in what I know and I stand by what I know, then they hear me. When people can sense that confidence or that… *(Uses her hands to express herself)* assertiveness they are more likely to listen to you. So, I think when those experiences happen in the classroom or the lab, I feel I need to be more assertive in what I'm saying so that I can stop that negative thinking. I just feel like I have to prove myself all the time in the classroom. When I sense that someone has looked down at me or doesn't look at me with high regard, their negative stereotypes and behaviors give me more motivation to do better the next time. I think it pushes me to stay on top of my academics. So, it keeps you on top and it's

like you are reminded that maybe I should've did a little bit more or maybe I should have taken advantage of this when you see that the other student got a higher GPA. Being an African American female is a challenge for me in this community. I think it is just that mindset feeling that you have to prove to the White people or to the majority that you know something or that you're not stupid or that you're smart. I think that's what the challenge is and just having that confidence in yourself and being okay with when you don't know something."

Support Systems

Christy revealed that she felt more comfortable with other minorities in her science classes. She explained that she subconsciously went into the lecture halls and looked for other Black people to sit with to make connections so that they could study and do well together. She felt like she did not have to prove herself to her peers in the Black and Latino community. These individuals were more accepting to those who looked like them.

According to Christy, "I think you just want to see people that look like you in class, it makes you much more comfortable. If I need a study partner depending on the situation, I may go to the first black person I see. I think Blacks and Latinos have not been received well in science classes by White students and because of this I just talk to other Black and Latino students because feel more comfortable talking to them. I feel with people outside my race I have to prove something. With Black people that are within my race, I don't feel like I have to prove myself. Since we are the minority and we all know we are the minority, it's like better if we connect with each other so that we can do well.

"Standing Alone"

The overarching message in Christy's narrative is that she is standing alone. On several occasions throughout her narrative Christy stated, "I did it on my own". Her reluctance to seek the assistance of others prevented her from academically excelling in the science campus community. When Christy first entered the university she lacked the necessary academic skills needed to successfully transition to the classroom. She experienced difficulty with academic preparation in her introductory science courses. She revealed that she voluntarily withdrew from her first Chemistry course because she had a rough time grasping the concepts. She thought it would be best to transfer into a introductory Chemistry course to acquire the fundamental skills needed. Ultimately, this set her back and she was placed in an uncompromising situation with her peers, who are ahead of her academically. She questioned her benefit to them, as she could not offer them help so she was excluded from the group. She referred to it as, "being late in the game".

Christy expressed concern about her disconnect and low sense of belonging in the science campus community as an African American women. She was fed up with trying to prove to others that she was smart, she stated," I have to prove myself all the time". She admitted that she will not wait to belong, if she did, it would take some time. She acknowledged that she made herself feel like she belonged by being more confident in herself and her academic abilities in the classroom. Christy was distressed by the behaviors of her peers in the science community who are supposed to "build each other up". She wanted to be motivated by her peers, instead, she was discouraged by their

behaviors of arrogance and selfishness. She described some of her peers as, “dog eat dog”, individuals in a viciously competitive environment when it came to grades.

When it came to academic course work standing alone was taught Christy to be, “assertive” and “confident” to show other students that she knew the work. As an African American women in the science campus community Christy did not want to be included, “at this point neither faculty nor students makes me feel like I fit in or belong… I don’t need you to tell me that I belong or not.” She was only concerned with achieving her goal of graduating from the university.

Lizzy's Story

"I'm Teeter Tottering"

Lizzy is an African American undergraduate student majoring in Biological Sciences. At the time of the interview she was a sophomore student with 55 credits in the major and a grade point average (GPA) of 3.25 after taking the introductory science courses in Chemistry, Biology, and Organic Chemistry.

Family Influence/Support

Lizzy began her narrative by talking about her family. Her parents met at the university and were married at one of the historic sights on campus. She has been a part of the campus since she was a young child attending soccer camps each summer since grade school. She credits her parents for assisting her with the college application process as well as choosing science as a major. She is still uncertain of her career goals but believes she still has time to decide.

> According to Lizzy, "I am not the first to attend college in my family. Both my parents (as well as my paternal grandmother, maternal and paternal aunt, paternal uncle, my godfather, and my brother's godmother) went here. I received some direction, but didn't need much push for applying to colleges or looking for colleges. I've always been one to be on top of everything, organizing in an excel sheet all the schools I wanted to visit, the dates I was going to visit, the majors they had that I was interested in, their requirements, average SAT scores, etc. My parents were involved by asking what I was interested in picking and choosing which colleges to apply to but that was really it. I'm very independent when it comes to these things, but will ask questions for guidance if I need it. I came to

this university because it was what I was familiar. I'm not sure of my ultimate career goal because I don't really have an ultimate goal, but multiple major/minor goals. I would like to go to medical school and get my MD/Ph.D. In radiology/ neuroscience/ oncology one of those. I would also like my MPH or MBA because I want to open my own women's center health facility focused on sex education and many women's health issues/diseases that are often neglected by society or women themselves being the primary caregivers of their families. I came across these goals because I'm doing research now and I'm really interested in it. Also, my dad has always made comments about being in the science field because that's what he is in. It just kind of made sense, it was what I was good at in high school. Having multiple connections and experiences along the way were really what motivated me to pursue a science major."

Intersections of Race and Gender

Lizzy admitted that her biggest challenge as an African American in science is working harder to prove to others and herself that she is capable of doing the work. She refers to the minority science program as a resource that has assisted her. Being surrounded by her peers in the program has been a great resource as others have left the science major. She has questioned herself a few time about leaving the science major but she has decided to stay in the major even though she is not doing so well in her Organic Chemistry class this semester.

Lizzy stated, "The biggest challenge is just knowing sometimes you have to work twice if not three times harder than the majority, to show and prove that you're capable of doing what others may think you are not capable of doing. Just

constantly studying for my science classes and being surrounded by my peers in the minority science program… that have very similar, yet distinctive goals of making a difference in the medical field. To a certain extent, I suppose it would be in the minority science program just being surrounded by minorities, just even proving yourself within the minority community that you're able to do it, especially when you see other people dropping out. Not necessarily dropping out of the university but finding like what they really want to do in non-science majors. I have asked myself challenging questions like, "Do I really want to do this?" Certain individuals do well in different courses. Some people are really good at Organic Chemistry. I'm not that good at it, even though like I put all of this effort into it and study, but I didn't do as other students in the class. I may put less time or the same amount of time. So I see it as proving it to myself that I can be successful in the science classes. Proving it to my White peers that I am smart and I can be successful in science. So that instance is more proving it to myself that I can do it when it comes to like individual classes. I guess personally, I felt like I had to prove myself in my research lab. I'm only the African American there. I'm working with another male and he works there with me and I'm just like pushed to the side. I'm told second about everything versus at the same time, so that's like really hard and just like having to prove myself so like I can still be involved in the experiments. That's like real frustrating. I have to assert myself into conversations instead of being invited."

Campus Support System

Lizzy expressed positive emotions about the support she has received on campus. She feels like she is comfortable and excited about being in the science campus community. Her comfort comes from other African American and Latinos students who are also participating in the minority science program. She explains that this program offers academic tutoring and other resources to only African American and Latino students studying in a science major. Yet, she is still unsure about staying in science because she wants to do other things. She gives homage to the university for keeping her in the science major so far.

> According to Lizzy, "It feels good as a community, because I'm a part of the minority program. All my friends in science are there and most of them are African Americans while others are Latino. So it's like being surrounded by other people that want to basically do what I want to do makes the academic support really comforting. I'm like teeter-tottering about what I do with science because I want to do science as well as something else. But I feel like I would have fell off this science wagon if I went to another school and didn't have the support that I have here at this university. So right now it's very comforting, and it's exciting because I've been involved in research and then when I do go home, I have like, what my mom would call my village at home that supports me and uplifts me. So it's encouraging like to see what's around me."

Lizzy has basically depended on the minority science program to guide her through the science courses. She has used the program for academic advisement and other resources because she is satisfied with the positive feelings she gets from the

program. The program helped her loose a little of her independence because of the guidance of the administrators. She is trying to gain it back as she is taking more rigorous courses, studying more on her own and being proactive within her major department. She has not had any negative experiences outside of the program but has heard of others negative experiences of not feeling valued.

> Lizzy stated, “I really depend on the minority science program. I don’t have to seek out people in the classroom because I have other individuals that are in the minority science program. In the introductory courses like Biology and Chemistry we try to sit next to each other. We also spend most of our time studying together outside of the class because studying is mandatory in the minority science program. So having all these resources with the mock exams, the extra instruction, and small ratios of students and teaching assistants was great for me. However, it is discouraging to see other minorities who don’t participate in the program because they don’t want to be lumped in with the minorities. Some Blacks and Latino students try to take the classes and study on their own and not use the minority science program because they don’t want to be talked about by the White students. I love the program because they hold your hand through a lot of things especially like freshmen year. I feel like they held me really tight freshmen year. They have restrictions or rules for those participating. For example, mandatory study time in their office and participating students are not allowed to miss a tutoring session. They did teach me to stay on top of my work because as you advance in the science requirements, it get tougher and harder requiring more individual study time. So now my exam grades are not as high as

they were in the introductory courses. I had a great freshmen year, because of the minority science program and I am not doing as well as I did last year. This year the science course work is a struggle for me. It's like getting back to my independence where I study with the program and then go to my room and use more study time on my own."

Sense of Belonging and Fit in the Science Campus Community

Lizzy felt like she had a connection or fit in the major with faculty she admitted that she does not seek out peers outside of the minority group because of the fear of more competition. However she used the resources of the minority science program. The program assisted her and gave her sense of belonging.

I think I fit in my major department because I really like my major and just like everyone else, there is always that one or two classes that you struggle with. Everyone is different, some people start to struggle in Biology some people start struggling in Organic Chemistry is where I struggled. My grades in science courses are my current struggle. I did really well in my first semester, so I think in the sense of struggle I fit in there as an African-American woman. I mean I am struggling but that doesn't mean I don't fit or belong in the science community. I have been seeking out different resources and finding other people that support me and asking for help in class from friends who are doing well. I think I fit in that sense. I think my fit comes more with faculty. I don't like studying with other students outside of the minority science program because they may be a distraction to me. I definitely think I fit more with faculty. I fit more with the faculty than I do with the student I just feel like as much as I can learn from peers

I can learn from faculty. I learn from faculty like talking about course work and the text book. I think it's a lot scarier because with your peers the double competition thing comes into play and competition kind of takes over. Its like, why would you purposely try to make someone else fail or do worse. We are supposedly helping each other out when we can. I am not into the competition thing with other classmates. I just want to learn and do well in the classroom. So, that was frustrating competing with my fellow classmates. Solely, being in the minority science program has contributed to my feeling like I belong/fit into the major department. The minority science program community has also been involved, not too involved, but enough that I know if there was an issue I could go to the Deans or advisors seeking helpful advice. Some resources that I have used to assist me in feeling connected to the science major was first living in an all STEM dorm my freshman year which exposed me to an environment that helped me focus and also connect with other STEM majors. I've also used the minority science program for tutoring and supplemental instruction, as well as resources and advice for applying to medical school and starting the process early. The minority science program has also aided in supporting me for research and professional development and graduate workshops."

"Struggle From Within"

In analyzing Lizzy's narrative, the overarching message that emerged was "struggle from within." Lizzy's decision to study a science was something that she continued to struggle with as she advanced in the science campus community. Early on in her narrative, Lizzy spoke with excitement of why she selected the science major and

how instrumental her dad was in helping her decide her major. Lizzy thought she had been successful in math and science during high school and she stated, “My dad has always made comments about being in the science field because that’s what he is in…it kind of made sense”. Later in her narrative, Lizzy spoke with uncertainty and reflected on her struggle in her science course. She grappled with the fact that she started off very well in her introductory science courses and unfortunately this success was short lived during her second year. “Everyone is different, so like some people started to struggle in Biology some people started struggling in Organic Chemistry which is what I struggled in … so this is like my struggle right now, because I did really well in my first semester.”

The key in analyzing Lizzy’s narrative came with the statement “… I am teeter tottering about what I want to do exactly.” At that point in her narrative her inner struggle about being in the science campus community emerged. She hoped to be successful and pursue a science major as an undergraduate student, however, she now faced an obstacle. Throughout her narrative Lizzy spoke of her battle to remain in the science major after she failed Organic Chemistry in her sophomore year. She doubted her abilities and showed a lack of confidence in herself, “some people are really good at Organic Chemistry. I’m not that good at it, even though I put lots effort into it and studying, but I didn’t do as well as my peers.”

Lizzy’s narrative highlighted her struggles from within and how it affected her connection to the science campus community. She believed her fit was with faculty, “I must say I don’t get along with peers but I get along with faculty…I fit more with the faculty then I do with the students.” Lizzy voiced concern about her connection with her peers outside of the minority science program calling all other peers a distraction:

"So I think in the sense of struggle I fit in there as an African-American woman. I was just like seeking out different resources and finding other people that support me. I think I fit in that sense. I think my fit comes more with faculty …. So, like I don't like studying with all the other people outside of the minority science program more because they maybe distraction to me…I definitely think I fit more with faculty."

Lizzy's sense of belonging and connection to her peers in the science campus community was hindered by her own fears of competition:

"I think it's a lot scarier because with your peers the double competition thing comes into play… competition kind of takes over, it's like, why would you purposely try to make someone else fail or do worse. We are supposedly helping each other out when we can. I am not into the competition thing with other classmates. I just want to learn and do well in the classroom. So, that was … frustrating... competing with my fellow classmates."

Despite her struggles from within, Lizzy found a community in which to connect within the minority science program on campus. She was comforted in knowing that many of them had some of the same struggles as she had but have overcome them. She also was reassured to know that she could always use them as a resource when needed. "I think I fit in my major because I really like my major and just like everyone else, there is always that one or two classes that you struggle with…"

Mary's Story

"I'm at a Disadvantage"

Mary is a Latina undergraduate student majoring in Biochemistry. At the time of the interview she was a senior student with 115 credits in the major and a grade point average (GPA) of 2.75 after completing majority of the requirements for graduation.

College Decision-Major Choice

Mary began her narrative by talking about why she came to this institution. She was once interested in medical school but has since changed her mind and wanted to pursue a career in research. She revealed that she loved science and wished that she would have known more about research when she was a first year student.

> I came to this specific institution for several reasons and one was location. I knew that my mom and my dad weren't going to have a sufficient amount of money to pay out of state tuition. I knew money was going to be an issue if I moved out of state. Also, I didn't want to be too far away from my parents. The other factor was this institution is known to have one of the most diversified research labs. So I chose that as another major thing. My ultimate dream job is to work for a company or any corporation related to the science I want to be a researcher for a company. One of the main reasons is my love for science. I really do love science and I'm really sad that I didn't get into research until much later on in my college career. The other reason is after being in college I realized that science is everywhere and I feel like there's so much more to learn about it and I want a little piece of it.

Intersection of Race and Gender

As Mary described her experience of being a Latina female in science here at the university, she believed the lack of minority students is a real concern for her especially in her major where there are very few women, even less Latino women. She detailed why she felt like she was at a disadvantage.

> According to Mary, "Being a minority is a disadvantage. Our numbers are very low compared to Caucasians. There are rarely any woman in biochemistry and when, if there is a woman, they are mostly Caucasian women. The other is the lack of faith in our academic abilities and also the negative stereotypes surrounding our lack of our academic abilities. We are judged before we say anything in lecture or take an exam. And I don't necessarily feel that it is this way because of being a Latino woman. I feel it is being a woman in general. When I ask other African American and Latina undergraduate women about their major many are in the school of arts. When they ask my major and I tell them biochemistry, they are shocked. One girl said, "I could never do that." "Why could you never study in a science major?" I asked. "What's holding you back?" I know everyone finds certain things more difficult than others. However, I feel, if I put work into my studies, then I can be successful. As minorities we must stick together to get others to join the majors. If there are only a few of us, we can't say let's team up and let's be study buddies. We need more of us. I have to find study partners outside of the major. It is always a little harder to find a group that's not within your own race. I do try my best to cross that barrier because I think that

there should be no barrier, but there is a barrier between the minorities. I'm talking about majority versus minority."

Self-Motivation

Mary described a research poster presentation event, which she participated in during the spring semester this was an experience that made her truly feel like a student in a science major.

> An experience that made me feel like a science major was when I participated in the researching event, and there were several students there who weren't even part of the program. But they just happened to hear about it by word of mouth. They were upper-class science students, juniors and seniors asking me questions about my poster and about my research project. I was so confident about my project and I answered those questions without any issues. They asked questions that I would've never like thought anyone was going to ask, just not completely based on my research, but maybe alternative things that really gave me like a giggly feeling. I knew the answers and the information about the project. I knew how to respond to that question and it made me feel like a scientist. That definitely did give me confidence. I feel that I have been learning. I think that sometimes we are too worried, based on theory and then when it comes to application, we don't know how to respond. But I feel like having that theory and having that form of application that day just saying it out loud, I was able to demonstrate not only to the people that asked me

the questions, but also to myself that, hey, this is possible and I was so happy that day.

Mary reverted back to her feelings of being at a disadvantage in the science community. She was proud to be a successful Latina who was graduating however, she believed her disadvantage came from the comfort level of others who did not look like her as a minority student. She revealed that her disadvantage also came in the form of not being prepared academically compared to other White students. She was lonely in the major since the numbers of minority students declined as each semester progressed.

> I'm very proud because one, I'm a woman graduating. Two, because I'm a Latina woman graduating even though prior to this I felt, why does it have to be a big deal? I don't know why it has to be a big deal, but it just is a big deal. I'm very proud. I am one year towards the end, but at first it of course it was very scary. It was very overwhelming just in general. I experienced culture shock because White students don't see that many of us here, I mean Latinos and they are not used to it. I wouldn't want to say that it's just based on skin tone but I think its how we look. They are not comfortable with us being around them. In this major I am pretty much the only Latino in many of my classes. It's naturally hard though and nothing freaks me out more than the first week of class and it always happens to be a class full of White students. Usually a student will either ask or answer a question no one else in the room knows anything about it. That's it, am I not prepared for this class or how did he know that, like what did he do?

Or she did she know that? …I'm definitely at a disadvantage here. So, I tend to question that. In many cases as the classes progress class size got smaller and the less people I recognized. In Biology 101 it was like 300 people in there, but as I start getting deeper into my major, it gets lonelier. Lonely in the sense that I am no longer in class with my friends. So, I feel a little lonelier in that way and lonely because I am the only Latino now during my junior and senior year. My friends, we used to take physics together that was good and now, they left science a few semesters ago and I've been by myself. I'm on my own, now I am just me, myself and I. I have people from my class who I don't really associate with in class, but definitely no association outside. So I feel loneliness and pride that I am still here in the major. Yeah, but I am also at an advantage because our numbers are smaller. So, now these companies will pick me because the minorities are at a smaller number … you have a greater chance at being picked for a job or graduate school. I am a Latina woman, it's good, but the fact that they would pick me because of my ethnicity no maybe it's not good (*takes a long pause*). I should just be picked based on what I am able to give, my knowledge and the skills I bring to the company and not based on what I look like. I mean, why else do they have the please specify your ethnicity check off thing everywhere you go? I mean I've applied to jobs now. I have been applying to different labs, other lab positions and that is one of the questions I make an attempt to always fill out, the one that ask, what ethnicity are you?"

Sense of Belonging and Fit in the Science Campus Community

Mary felt like she fit into the science community because she loved the major. She revealed that she had no friends in the major. She attributed this to her status as a fifth-year senior who did not take the introductory courses with her cohort of students. She was in remedial classes trying to catch up. She was unsure about how she felt, on one hand it was acceptable that she had no friends, on the contrary, she believed she should have friends in the classroom to lean on for help. Her first year cohort of classmates graduated last year, which put her at a disadvantage socially, when looking for a study partner. She described her experience with classmates as intimidating. Mary was trying to find a fit however, she was having a hard time connecting to her peers.

> According to Mary, "I feel like I belong here in the major because it's something I like. I may not fit in; in terms of do I have friendship with these people in the science community? No, but maybe because I also haven't given them a chance to be friends with me…I don't think that being that completely buddy-buddy is going to work for us. However, I still feel like I should have some friends within the major and I'm not anti-social. I do feel like I should have some friends, but I don't. I'm much older and I feel like they are friends because they have been taking class together since they entered the university. Also, because I am from a different background, I am a Latino. So, I feel like I'm at a disadvantage because I'm not friends with them. The White students have their own groups. If I was their friend maybe they would say, "We're reading up on this", or "did you catch this", "he said this or this can be used"…Yeah, briefing me, or giving me study techniques and study materials that they came up with themselves or that they

found. I'm always eavesdropping in the back so, what did he say? I don't know, it's very intimidating, especially with the White girls. The boys are always very, a little more open about it like, "I did this" it's harder to walk up to a White female and ask for help…although when I have, it's weird. They don't want to help me.

Mary discussed her feelings about approaching a White professor in the science community. She described the age of the professor as a drawback.

According to Mary, "I have never felt intimidated by a professor just on what he looks like. I feel more intimidated by the age of the professor. In my experience the younger professors are a little more approachable than the older professors. The demeanor of the professor makes a difference. There are certain professors, I would never talk to, and there are certain professors who I would never go to their office hours. A few are not approachable they make me feel like I am dumb. I feel very intimidated and I shouldn't feel that way. Depends on what it is… but there is this one professor, I will always go to her and to be honest, maybe it's because she is a woman, she is helpful, she is nice, she makes me feel comfortable. She is the only woman professor I have had in the science this advanced… they are always men, white old men."

Faculty Interactions

Mary commented on her connection to the faculty but not with students. She revealed that she blocked others out as a defense mechanism, by using strategies to cope with reality to maintain a self-image, in this case she did not want others to think she is dumb.

> According to Mary, "I have no friends in the Biochemistry major, but I have two faculty members who I can be comfortable around, so I'm going to say I fit in more with, faculty, not students. I am dependent on myself as in like, no one looks out for me. I look out for my own self, but I think that independence is more of a defense mechanism more than anything. I want to prove I am smart to my professor, because at the end of the day he controls my grade. I don't feel like I have to prove that to my peers … I don't share my grades. If someone were to ask me about my grades and I have been asked, I'm like I give them a vague answer. I don't try to prove myself to them. Maybe to my parents, and to my professor, but not to anyone else. I think it's just in competition. Okay, it's a competition, but a competition for myself that I have to prove to myself, my parents and the professor, but not prove that to my other colleagues."

"Still Standing"

In analyzing Mary's narrative the overarching message that emerged was "still standing". Mary's experience of being a Latina women in the science campus community was deeply connected to her concern with being disadvantaged by taking remedial classes when she first entered the university. The act of being left behind by her cohort of peers had a significant effect on her, as she expressed the need for friendships with her peers.

Despite her academic delay, Mary was able to successfully navigate her way through the science campus community. She expressed, "loneliness and pride" that she was still in the major and would soon graduate with a science undergraduate degree, regardless of the challenges she faced. Mary described how she had overcome some difficulties in her academic journey, from being placed in remedial courses to not being

able to create friendships with peers in her major department. The best example from her narrative that captures the true essence of how she felt was when she stated, “I’m very proud because one, it’s a women graduating. Two, because it’s a Latina women graduating…it just is a big deal…I am very proud”.

Regardless of Mary’s academic difficulties she was able to find a support network outside of the science campus community. She voiced appreciation to the minority programs on campus for being, “go getters” who sought her out and motivated her with much needed resources. Mary also credited her academic confidence to a poster presentation session that made her feel like she was a true student in a science major. She was able to participate in the presentation along with other students from the science campus community and apply her knowledge from her research in the laboratory.

Mary was determined to fit in with the faculty even though it was a struggle to make a connection with her peers. Her narrative expressed her need for friendships with her peers however, she took some of the blame for being resistant towards her peers in the classroom. She acknowledged, “…I have not given them a chance to be friends with me”, which was why she is struggling to find a connection with her peers in her major department. As a fifth year senior Mary was intimidated by her peers, she was worried about her self-image, it was her intention to prove to the faculty and peers that she was “…not dumb”, despite her academic struggles in the beginning.

Mary was still standing because of her love for science. She was determined to be successful in the science campus community. Her goal of earning a research position was very important to her after graduation. Mary’s determination to rise above her circumstances allowed her to exist in the science campus community which showed her

willingness to go through some changes to get what she wanted. “Everyone finds certain things more difficult than others…however, I feel like, if you put work into it then you can do it…”

Pamela’s Story

“I’m Out of Place”

Pamela is an African American undergraduate student majoring in Chemistry. At the time of the interview she was a senior with 112 credits in the major and a grade point average (GPA) of 2.95 after completing majority of the requirements needed for graduation.

College Decision-Major Choice

Pamela began her narrative by talking about why she selected chemistry as a major. She discussed her interest of teaching chemistry at the high school and college level as well as her desire to perform chemistry research in a laboratory setting.

> According to Pamela, “In high school I liked chemistry, so when I came to college I decided to major in chemistry. I started tutoring as a Teaching Assistant. I went into study groups basically pushing me towards teaching, and recently I started doing research in a lab this is pushing me towards working in a lab. Right now we’re working on a small molecule project. My high school teacher influenced me to study chemistry. I really enjoyed chemistry and I didn’t see myself studying biology. I absolutely hate biology, and psychology was okay. I didn’t get introduced to psychology until I came here. I had no previous knowledge of the subject. It was my teacher being like active. He was so happy and passionate about teaching us. We were willing to learn and we did a whole

bunch of like lab experiments in class. That was probably it, the crazy things, but basically he was real happy about his job, so it made me enjoy learning from him."

Sense of Belonging and Fit the Science Campus Community

Pamela felt unsure about her fit in the science campus community, she associated fitting into the community with achieving good grades in the required science courses. She revealed that certain people in the major questioned if she was smart enough. She felt like she had a connection in the science campus community to other minority students whom she tutored. She indicated that minority students respected her and admired for being a chemistry major. Additionally, Pamela was proactive in approaching faculty for help in the Chemistry department she stated, "I'm going to make them talk to me".

According to Pamela, "I feel like I belong here. I'm doing well in my classes, so in that aspect, yes. But l feel certain students don't want to talk to me because they don't think I'm smart enough to do the course work… so in that aspect no, not really. I fit into the science community only when I'm like teaching or tutoring, so a lot of students who are minority look up to me. They say to other peers, "Look she's a chemistry major, she can do this, she can help me, and maybe one day I can be that successful in chemistry too." As far as the professors are concerned… Some professors in the Chemistry department are just like, I don't know if they're really busy or if they just pretend to be busy. They'll be sitting at the computer and they wouldn't even acknowledge I'm standing at the door. I've never had a professor actually who just say straight out like, no I'm not going to help you. They'll try blowing me off for a little while, but then they help

me. I used to sit outside of one of my professors office in the beginning of the semester all the time, but he wasn't the type to blow you off. I would walk into his office and say, "do you have free time right now I have a question about this?" He would help me, so like if I really want the help, I'm going to go to them and I'm going to make them talk to me. I am the only black person in class and they recognize me, but they probably won't know my name. I guess it depends, when I think of different experiences. Sometimes certain professors make me feel really good about being chemistry major and then sometimes peers who were in my classes made me feel like I fit in too. So, it really depends on the situation. I feel like I fit because I am succeeding in the classes."

Intersections of Race and Gender

Pamela voiced concern about being the only Black student in the majority of her chemistry classes. She expressed concern for feeling out of place in the classroom where she sometimes felt uncomfortable about being the only Black student. She came into the university in remedial classes and had to work her way to the required courses. Pamela thought it may be a great idea to attend graduate school here so that maybe the university would hire her as a Black female chemistry professor.

According to Pamela, "Sometimes I find it hard because I look around and I'm the only black person in my class, and I'm just like oh, great. I remember one time from my recitation at the beginning of the semester, my teacher said, "you're part of the Asian club" because all of the students in the class were Asian so I hung out with them. I was just talking to my sister the other day about graduation and how I should probably do my graduate degree here because they should hire

me as a chemistry professor here afterwards. I searched and found out there are no black female professors in chemistry here. There's only two or three black male professors in chemistry. Sometimes I feel real uncomfortable about it. Sometimes I don't want to approach certain people in the department because I know they'll just blow me off. I have experienced a professor just look at me. When I came for office hours, I could imagine him saying, "What are you doing here?" "You're not supposed to be here?" and I felt like saying, "I'm a chemistry major, I am supposed to be here." Sometimes I feel out of place I guess. Like, I shouldn't be here, but then something is keeping me here. What's keeping me here is that I really want a chemistry degree. I really want to be able to teach chemistry to high school and possibly college students. Sometimes it can be lonely because I know from one of my classes there's only ten of us there, and all of them took honors altogether. So we all know each other. I'm like I'm the only outsider, so they'll be talking to each other explaining things to each other and I'm just sitting there. I'm like you guys don't even know my name, so like there's no way for me to fit in with their group."

Faculty Interactions

Pamela reiterated that she was the only Black person in many of her Chemistry classes. She admitted it bothered her that she was unable to seek help from someone that looked like her in her major department. She voiced concern about the few Black women in the Chemistry major department and the professional field.

According to Pamela, "…I have the habit of going to class and I then I look around like oh, look I'm the only Black person in class. There are not a lot of

African Americans and there's not a lot of African-American women. So, like I was saying that like the university should just hire me. If I wanted to go to someone who looked like me, there is no one to go to, I will have to go to a male professor. But it doesn't really matter…No, it don't matter, in the end it really don't matter. It's just oh, if you can share your knowledge with me, I'll happy accept it. One of my professors was telling me like oh, you're probably going to get into grad schools easily, get a job easily just because you're Black and you're a woman and a scientist. So, like I don't know how true that is, but it kind of made me feel better because not a lot of people want to go into chemistry so… I kind of think, it is true … I don't know, because like I look around and I don't see women, like Black women chemists. So, I kind of think oh, maybe somewhere out there someone is looking for me to work at their company. On the other hand I don't think this is true…Because that just don't make that company look good in their eyes. Like, then at that point I'll feel like they'll hire me just to say oh, we have a Black person working here. This incident makes me work harder now... I just see the big picture, in the end I'm going to get a chem. degree. Like, I'm not leaving here without my chem. degree. I feel more confident than I was before and at some points I was just sitting in my room crying. Yeah, I don't think I can do this anymore, I was about to give up, and now I'm just like I've got this, I can do this. I don't know it's something different about this semester where like I just feel less stressed about everything, and just because I feel less stressed I'm doing better, and it is not even that I'm taking less credits than I was previously. Maybe, it's just I've learned how to study better. I'm mad that it took me this

long. Seeing people before me, all my tutors succeed in whatever that they were doing really helped me. Like I've learned that oh, this person did this a certain way, maybe I should try that and see if it works for me, and not try something else. Like, for one of my classes now I have four different textbooks that I read just so I can understand the information. If my professors are not going to help me. I'm going to find a way. I YouTube a lot of stuff and I'm reading all these books. I'm going out and getting different information from different sources. Just, so I can make sure I understand this material."

"Finding My Way"

The overarching theme that emerged from Pamela's narrative was "finding my way". Pamela's experience of being in the science campus community was filled with pride, loneliness and exploration. Pamela expressed pride in the sense that she was overjoyed about being given the opportunity to major in Chemistry. However, she was lonely in her science classes. She called herself an "outsider" because of the lack of connection to her Chemistry peers. Exploration in the sense that she was still searching to find her way in an "uncomfortable" environment where she deeply wanted to belong and be successful. Pamela's enthusiasm about science can be felt throughout her narrative.

The key in analyzing Pamela's narrative came with the statement, "I look around and I am the only Black person in my class". At this point in her narrative her sense of belonging was challenged as she searched for a connection to others who did not look like her on the outside. Pamela was unsure of her sense of belonging in the science campus community. There were times when she believed she fits and then there were other incidents where she questioned her fit. She described it as situational. For example,

she stated, “I fit into the science community only when I am like teaching or tutoring”. Later in her narrative she stated, “I guess it depends, like when I think of like different experiences; sometimes I feel like my professors made me feel like really good about being a chemistry major and then sometimes like my friends who were in my classes made me feel like I fit in too. So, it really depends on the situation.” These statements provided evidence that she wanted to connect with the community. She had experienced rejection at times from faculty and peers however, her ambition helped her continue to seek new ways to be included.

Pamela revealed that she had doubts and wanted to change her major but decided against the thought of giving up. Despite not having many African American role models in Chemistry she saw the need to work harder to advance in the science community. Pamela agreed that confidence and more effective study skills were important to doing well in the science campus community. This is how she eventually found her fit. She associated fitting in with the fact that she was succeeding in the science courses. She was convinced and said, “I am going to find a way.”

Themes Across the Narratives

Each of the eight narratives included in this research study provided a unique representation of the experiences of African American and Latina undergraduate women and their sense of belonging in the science campus community. While each narrative has been presented it is also important to gain a deeper understanding of how they relate to one another. This section provides a discussion of the reoccurring themes that developed across the eight narratives. Five overarching themes developed from the narratives: Support Systems, Expectations and Motivations of Success, Academic Challenges/Struggle, Overcoming Stereotypical Barriers, and Sense of Belonging and Fit.

Support Systems

The support systems theme related to four different areas of support: (1) strong support from family, (2) support from minority peers in the science campus community, (3) assistance from learning centers and (4) support from the minority science program on campus.

Support from family. The participants reported that it was the support that they received from their families that assisted them during their college experiences. The participants talked about the value of family support for choosing a science major prior to enrolling at the university as well as studying a science once they arrived on campus.

Amy, an African American Environmental Engineering major stated:

> My dad always told us you have to break the barrier. Not everyone has to be a Doctor, not everyone has to be a Nurse, not everyone even has to be an Engineer but you just have to do something different. Those talks got me to move forward, doing different stuff than other people that set me apart. So that's also why I chose the major. He has always told me things like that, so yeah my dad, he's been a really big motivation in my life and in college. He supports me when I need direction. He knows just what to say to me.

Jane, a Latina Animal Science major stated:

> Mom was one of the big influences of why I selected Animal Science. Definitely, yeah she was pretty much the only one, no one else, everyone wanted me to be a Doctor in the family I mean. She is the supportive one that keeps pushing me to be successful.

Lizzy, an African American Biological Science major stated:

> My dad has always made comments about being in the science field because that's what he is in. It just kind of made sense, it was what I was good at and he noticed it he knows me. I use my family to help motivate me stay in science. When I struggled in a science course I called my parents…my mom she just thinks it's not the end of the world if I don't perform well on an exam… and my Dad says, "You'll do better, keep trying."

Participants reported that their parents gave them some form of advice to encourage them to study a unique discipline such as science. Participants in this study described their parents as being encouraging and supportive of their academic efforts. Participants also credit their parents for encouraging them to continue in the science major while in college despite feeling like STEM was a difficult path for them. Research shows that parental support can be valuable in positively influencing minority students to achieve academically, as minority parents have high aspirations for their children's academic attainment and success. Consistent with the findings in Gofen (2009), where almost every student in the research study mentioned that family was influential to perusing a college education. Gofen (2009) used semi-structured interviews to analyze the role of family in college students. The family members in the study were described as a "resource rather than a constraint" (p.114). The families in this study were also instrumental in providing much needed support to their children as their children served as a proxy that parents used to measure themselves (Gofen, 2009).

Support from peers. Participants reported that their minority peers supported them through tough academic experiences. Discussing course work with minority peers stands out as a very important strategy, which contributed to the sense of belonging for many of the participants (Deli-Amen, 2011). Participants felt they could rely on their peers to assist them with understanding course work. This also helped many of the participants find other peers to study with. Finding peers who believed in their academic abilities was important to the participants. They also reported that they received encouragement outside of the classroom from their minority peers, which made them feel comfortable when approaching those peers. However, some participants voiced concern with asking White peers for help with course work. Peer interactions inside and outside of the classroom and were noted to be very useful (Deli-Amen, 2011).

Jane, a Latina Animal Science major stated:

> I was really good friends with a senior she was also a Latina and she was pre vet my first two semesters. She was at that point that she already got accepted into vet school. She is very smart and we became really good friends and she was helping me in the lab and with my other science courses. We reviewed course work together all the time. She explained the concepts I didn't understand. She also helped me get my current internship at the Animal Hospital. She told me everything I needed to know about the practice and the Vet school application process.

Pam, an African American Chemistry major stated:

> My other minority friends pushed me and supported my when I needed them. They were there to always encourage me when I had a bad exam grade or when the textbook reading just seemed almost impossible to understand. I could talk to them about the course work that I was having a hard time understanding. I didn't feel they would judge me or think I wasn't trying to grasp the concepts. They knew I studied hard.

Peer relationships are important to the transition and success of college students (Tinto, 1997). When students have positive peer relationships on campus they are likely

to feel like they have the support needed to achieve their academic goals. Hoffman et al., (2002) posits that perceived peer support was one of the five factors used to measure college student's sense of belonging. In their study peer support was very important to the sense of belonging for African Americans students. As indicated in this research study Jane and Pam reported that their peers served as a support network for them inside and outside of the classroom. Peer support offered both participants a formal opportunity to talk about academic and non-academic issues.

Support from learning centers. The Learning Center on campus provided the participants with collaborative learning opportunities to support their pursuits to academic success. This learning environment allowed them to work with others to solve problems and master difficult course material. The participants used this resource to seek out academic assistance for required science and math courses. Pamela, a Chemistry major, voiced appreciation for the support she was given from the campus community. She made a specific mention of the Learning Assistance (LA) program, which is housed in the university Learning Center supported her academically.

Pamela, an African American Chemistry major stated:

> With my science and math courses I have used the tutors everywhere on campus. I used to have multiple math tutors and multiple science tutors. I used support programs all over campus. With all of the programs I'm a part of one that definitely helped and supported me the most was the (LA) program. It helped me teach and learn concepts for all my science classes. The people there were very supportive. I could ask questions all day and they would continue to help. These were faculty, graduate students and other peers who staff this program.

Tutoring from the college learning centers was reported to have a positive effect on student achievement in science and mathematics (Mastropieri, Scruggs, & Gaetz, 2005; Topping, Campbell, Douglas, & Smith, 2003). Both studies suggested that the use

of tutoring services is an effective intervention for supporting student-learning objectives.

Support from the minority science program. The minority science program served as a support network to many of the participants in this study. Initially, all minority students were sent a letter the summer before enrolling in their first year, as they have declared a STEM major during the college application process. In this letter minority students were encouraged to join the program. The goal of the minority science program was to increase the recruitment and academic success of underrepresented minority students, who are interested in STEM professions after graduation. Additionally, the programs aim is to improve the percentage of underrepresented students entering the scientific fields by encouraging academic achievement in the sciences through unique and rigorous academic support.

Jody an African American Exercise Science major stated:

> If I didn't have the help of the minority science program I don't really know how I would have made it this far. My math skills were not strong in high school. They did a poor job of teaching Math. And, you know, that was a big part of saying you wanted to study in a science major. I'm here now because of all that support.

Amy an African American Environmental Engineering major stated:

> …your confidence definitely rises when you have that kind of support group and you have people just helping you every step of the way. The minority science program was there for me since my first semester at the university.

Macy, an African American Biological Science major stated:

> I have been a part of the minority science program since freshman year. They really I guess they took me under their wing. I go to them when it comes to studying for my courses and tutoring. I use the program mainly for tutoring because the recitation sessions are serious. You get a lot of studying done mostly in groups, which allow you to work with others.

The participants reported that the minority science program provided the support needed to achieve academic goals. The support was expressed in several forms: academic advisement, tutoring, career counseling, motivation and praise from staff and peers, as well as test preparation for the GRE and MCAT exams. Lastly, the minority science program provided a safe space for minority students. The program was a place where minority students gathered and socialized in groups outside of the classroom to have academic and social conversations. In the setting many students met other African Americans and Latinos for the first time, as many are separated into a variety of science disciplines.

The support theme revealed how essential support was to the participants. Support from family, peers, the learning center, and the minority science program provided the necessary encouragement for helping the participants achieve academic success. Support was an important factor as it had a strong effect on the student's sense of belonging in the college campus environment. Support determined how the participants adjusted and made a commitment to the science major. The availability of support services also played a pivotal role in the retention and progress toward graduation for the participants. Additionally, the support from peers and family provided help, guidance, and emotional support that assisted them in dealing with the pressure of being a minority in the science campus community.

Expectations and Motivation of Success

The *Expectations and Motivation of Success theme* comments related to participants who expected to be successful in the science campus community despite feeling like they do not fit in with peers. They believed they were capable and would not

allow fear to hinder them; as failure was not an option many anticipated success prior to coming to college (Bandura, 1997). The participants made a commitment to stay in the science major, even though other peers changed their interest to a non-science major. Throughout the interviews, participants expressed a strong drive about being successful in science, they held high expectations for themselves.

Pamela an African American Chemistry major stated:

> I just see the big picture, in the end I'm going to get a Chemistry degree. Like, I'm not leaving here without my Chemistry degree. I worked too hard and my family is counting on me to finish and be successful. I am also counting on myself to be successful.

Kelly, a Latina Exercise Science major stated:

> …just getting closer and closer to my goal and like I have noticed that like I progressively have been doing better in my courses as each semester goes by, and I think that improvement just pushes me even further. I have to complete this especially now that I was accepted into the research program this summer I feel like that's a huge motivation because I feel so much closer to my goal. I got to finish this.

The participant's drive was consistent with the findings of Allen (1999). Participants in this study also had a strong desire to achieve their goals of academic success and persist in college. Allen (1999) found that desire to finish college-influenced persistence. In the study minority students ranked desire to finish college at the top of the list of items that had a perceived influence on their persistence.

The motivation related to the participants ability to encourage themselves despite the challenges they faced in the science campus community. The participant's motivation came from their personal inner drive to achieve academic goals in science (Deci & Ryan, 2000). Across the narratives, participants mentioned their love, satisfaction, and fulfillment the science discipline provided them. The participants found the challenge of

acquiring knowledge in science rewarding. The participants believed they could be successful if they continued to work harder and stay determined from within using intrinsic motivation (Deci & Ryan, 2000). The participants also mentioned seeking ways to build their confidence to stay motivated.

Christy a Nutritional Science major stated:

> …I think it's just more about being self-confident like those negative classroom experiences show me like I need to be like assertive in what I know and what I want. So, because like if I repeat those behaviors, I'm going to get the same results, for example, I mean if I'm still hesitate about speaking up for myself in class and in lab others won't listen to me.

Pamela a Chemistry major stated:

> I feel more confident than I was before, at some points I would just sit in my room and cry. Yeah, I don't think I can do this anymore, I'm about to give up, and now I'm just like I got this! I can do this! I don't know it's something different about this semester where like I just feel less stressed about everything, and just because I feel less stressed, I'm doing better, and it is not even that I'm taking less credits than I was previously. Maybe, it's just I've learned how to study better and focus on me. I'm mad that it took me this long. My confidence has really picked up.

Many of the participants were also motived because they were able to develop well-established academic goals to help them persist in the science campus community. These goals are not always easy to develop as many participants indicated it took time to figure out how to go about creating an effective goal. The participants used goal-setting strategies to assist them with social and academic objectives. According to goal setting theory individuals perform best when goals are challenging and specific but obtainable (Schunk, 1990). The theory posits that the individual must take ownership and must be committed to the goal. Additionally, the individual must possess the required skills to complete the task at hand (Schunk, 1990). The participants in this study reported how

hard they work inside and outside of the classroom to achieve their academic goals in the science campus community. Motivation served as the reason for participants to stay in the science campus community. Participants discussed how important it was to feel connected to peers and faculty, which was a motivational factor. This allowed students to develop tools to help them engage and become active participants in the learning process.

Academic Challenge/Struggle

The *Academic Challenge/Struggle theme* related to participants having a hard time with academic requirements as courses were challenging and demanding causing students to question if they would leave the major (Tinto, 1987; Bonous-Hammarth, 2000) to study a non-science discipline. The participants were frustrated, as courses became more challenging in their respective science departments. Many expressed concern for peers who left the science major after their first year at the university (Griffith, 2010). They mentioned struggling because of their lack of preparation from high school classrooms. A few participants enrolled into the university with math and writing placements that required remediation, they were not able to enroll in college level science courses until their second year (Bonous-Hammarth, 2000). Enrolling in a remedial course as a college student was a form of an academic struggle for many of the participants.

Christy a Nutritional Science major stated:

> The science background was not that strong in my high school overall so I was kind of disadvantaged in the sense of like coming to this university, where first year students were already on top of it, like on top of the science course and requirements. I was left behind because I had to take a remedial class in Chemistry.

Mary a Biotechnology student stated:

> I came into the university from a different background than these students in my major. So many of them did not have to go through the remedial courses like I did. I had to take a remedial writing course and a remedial math course in my first year. So, I feel like I'm at a disadvantage. I'm older, I mean not by much, but a year or two does kind of make a difference. I feel like you can definitely weed out a sophomore from a senior.

Jane an Animal Science major stated:

> …a lot of the other students who were in animal science with me like the Blacks and Latinos I entered the first year with and friends that I went to high school with or any other people they didn't continue with the path. By the second year they changed their majors to a non-science discipline. I had a hard time forming my study group because they left. It was a struggle to find others to study with.

Many of the academic challenges the participants reported are consistent with the findings from the National Science Board (2010) which found that students who come from low socioeconomic households are more likely to attend low achieving schools that lack much needed educational resources. African American and Latino students are often products of their environment when compared to their White and Asian peers. Therefore, they are more likely to experience educational environments where quality teachers in mathematics and science are not provided (National Science Board, 2010). Consequently, African American and Latino students enter college classrooms at a disadvantage because they may not have been offered advanced placement (AP) courses, which provide them with prior preparation for the college mathematics and introductory science courses.

The participants in this study voiced concern over their mathematics and science placement when they entered the university as first year students, as many were from urban school districts that did not provide AP courses to give them an academic edge in college. If the participant's school district did provide AP courses the female students from this study did not enroll in courses that would prepare them for STEM related

college majors such as: Chemistry, Calculus, or Physics. They enrolled in AP courses such as: History, Environmental Science and English. As a result, many of the participants placed below college level on the placement exam and were excluded from participating in science courses during their first year. The struggle participants voiced was in reference to academic requirements, which left them at a disadvantage because of their demographics and family backgrounds. Additionally, participants discussed deficiencies in their high school academic preparation and how it also placed many of them at a severe disadvantage.

Academic preparation was a major concern for many of the participants in this study. They were concerned about the environmental and cultural differences that impacted their academic performance before college and throughout college. Many of the participants were motivated to attend college however, they were not academically prepared for the rigor of college course work. The participants suggested that more must be done to prepare students to be college ready once they arrive on campus. The participants suggested assisting African American and Latina students with learning how to choose the right courses, learning effective study habits, as well as knowing where to go for help.

Overcoming Stereotypical Barriers

The *overcoming stereotypical barriers* theme related to the participants who believed they had to prove themselves in order to be taken seriously by faculty and peers in the science campus community. Participants mentioned on several occasions they had to apply themselves to prove that they were willing will work hard to dispel negative stereotypes about their academic abilities (Steele, 1997). The comments related to

participants who believed they had to work twice as hard as others to show that they are smart, hardworking, motivated, and most of all willing to study to achieve their academic goals. Participants were concerned with the fact that they had to prove to faculty they were passionate about the subject matter during lecture and office hours when requesting assistance from faculty. Additionally, participants commented on being articulate around White faculty and peers from the department and laboratory to prove to them that they were capable of being in the science campus community and that they were research worthy. The participants wanted to prove they are the opposite of all the negative things others thought of them as African American and Latina women and scholars.

Macy an African American Biological Science major stated:

> …it is so complicated, it is stressful, like that's the most stressful part of knowing what you are doing but then having and prove that you are not the person that is the free loader…

Lizzy an African American Biological Science major stated:

> …sometimes you have to work twice if not three times harder than the majority, to show and prove that you're capable of doing what others may think you are not capable of doing.

Some participants questioned if they were smart enough to study in a rigorous major. The participants experienced feeling intimidated by faculty and peers as many were the only African American, Latina, or female students in the science classroom. A few participants voiced concern, as they have never been in an academic environment as the "only one", which made them doubt if they belong in the science community. The only one could refer to being, the only African American, the only Latino, or the only female student in the classroom or laboratory. Their fear and self-doubt made things

worse in the classroom setting. One participant admitted she participated very little in class due to not wanting others to think she was dumb.

Kelly an Exercise Science major stated:

> I failed Organic Chemistry the first time around I studied a lot but I guess you slip in studying right? It definitely did make me question myself and if I had what it took to get into medical school or stay in the science major. I don't know, it just definitely gave me a lot of self-doubt. I was questioning if this is something I should do. I doubted myself all semester after failing that course.

Amy an Environmental Engineering major stated:

> "…Yeah, at one point after having a very bad semester in one of my science classes I started to doubt myself. I said, "I don't think I can do this anymore, I'm about to give up…"

Mary a Biotechnology major stated:

> "I don't talk much in class. I don't want them I mean the other students to think I am dumb or I don't want my professor to think like I am dumb, because that's one of the worst feelings when your professor is like, what are you talking about?"

The participants in this study held negative perceptions because of the different treatment they experienced by faculty and peers in the science campus community. They described situations where they were judged and labeled negatively based on their appearance. Many of the participants reported that their individual uniqueness was taken for granted as they encountered stereotypes about their academic abilities. The participants gave examples such as: African Americans and Latinas are less intelligent than others racial groups on campus. The participants reported that these experiences challenged their confidence levels when dealing with difficult situations. These experiences also caused some participants unnecessary stress and anxiety, which led them to underperforming at times. Other participants developed more positive outlook on the negative experiences. They used goal setting as a strategy to help them stay on track with

their studies. Additionally, establishing goals helped the participants achieve self-confidence. As they focused on academically improving in the classroom they were able to achieve their accomplishments, which boosted their self-confidence. Many of the participants believed it was important to set goals and work harder to dispel the negative thoughts other peers and faculty may have held about them in the past. They were determined to study vigorously so that they could go into the classroom armed with knowledge to participate in class and perform exceptionally well on the exams. This allowed many to show their peers and professors that they were serious about learning. They did not accept the beliefs and values of the dominant White students and professors regarding the negative stereotypes, instead they continued to believe in themselves and stayed confident in their academic abilities. This is consistent with the research of Fries-Britt and Griffin (2007) where undergraduate African American participants employed techniques for success. The participants reported trying to dispel myths and stereotypes their peers had about their academic abilities. The participants felt pressured to behave as if they were non-Black. Additionally, they had to constantly prove they were accepted into the honors program based on their academic accomplishments not because of their race and ethnicity. The participants in this study also felt like they spent most of their time educating their White peers about minority stereotypes.

Overcoming stereotypical barriers appeared to be a very difficult experience for many participants. These participants felt they did not identify with their campus communities, as there were less faculty and students who looked like them. They reported having to routinely contend with stereotypes about their race, gender and academic abilities in the science discipline. As time went on many of the participants

learned how to move beyond these experience and focus on their academic studies and other social experiences outside of the classroom.

Sense of Belonging and Fit

The sense of *belonging and fit* theme focused on the participant's sense of *belonging* in the science campus community, their need to seek validation from other students and faculty members in an unknown environment. The participants arrived on campus with a strong sense of belonging because of their interest in science (Strayhorn, 2012). The participants described their sense of belonging in a unique way. They referenced the term belonging as a right to be in the science campus community. Many participants with a sense of belonging were those who were successfully completing courses and persisted to the next level of courses in the major (Hoffman et al., 2003). The participants focused on belonging as a deserving factor due to their determination and hard work devoted to their academic studies. For other participants who voiced concern with belonging in the science campus community, they described feeling a diminished sense of belonging in an environment of individuals who they could not relate (Johnson et al., 2007). Perhaps, the term fit allowed them to put their experiences into perspective. Many lacked a sense of belonging however, when asked if they fit into the science campus community many waivered in their responses. Their fit all depended on the environment and how the individuals in that environment interacted or failed to interact with the participants.

Amy an Environmental Engineering major stated:

> …I feel like *(takes a pause)* I kind of like *(takes a pause)* I want to fit. So I don't know. I thought I just fit academically or in my own knowledge, I know what I am doing so I feel like that's where I fit in, academically. I don't think there is

anywhere I really "fit" if you think about both demographics of the class I don't think I fit in.

Lizzy a Biological Science major stated:

I think my fit comes more with faculty… So I think in the sense of struggle I fit in there as an African-American woman. I was seeking out different resources and finding other people that support me. I think I fit in that sense. The minority science program has contributed to my feeling like I belong or fit into the major department. The college community has also been involved… enough that I know if there was an issue I could go to the Deans or advisors seeking helpful advice and support when I need it.

Mary a Biological Science major stated:

…My goal is to not necessarily fit in. The goal is not to fit in, that should never be the goal. The goal should be to get what you need to get done and ideally stand out at the same time. I feel like I belong, I feel like the faculty has accepted that I am a force to be reckoned with…

Some participants mentioned attending faculty office hours for assistance, which encouraged their sense of belonging. While, other participants felt faculty office hours and faculty academic advising sessions were resourceful as long as the professor was welcoming (Tinto, 1993). Participants who had a connection to their faculty members built up the confidence to approach these individuals whether through in class conversations, office hours, or electronically through email. Participants reported that they were interested in approaching faculty members who made them feel supported, safe, and comfortable all which helped increase their sense of belonging inside and outside of the classroom. When participants did not feel comfortable they choose not to approach faculty, they found other resources to assist them.

The sense of belonging theme related to the perceptions or ideas linked to belonging or not belonging in the science campus community. The participant's perceptions were shaped in a personal and social context. For many of the participants

their sense of belonging derived from the connections made with faculty, staff, and peers who they regularly interacted with in the college campus community. Belonging helped them find a connection to these individuals and a feeling of acceptance. However, for other participants belonging also made them compromise who they were personally and individually. Participants, who described not fitting in experienced how difficult it was which, ultimately lead to unhappiness in the science campus community. These students felt rejected from lab group assignments and study groups outside of the classroom. Few students complained about peers in the classroom who did not know their names.

According to Strayhorn (2012) when students in the college educational settings do not develop a sense of belongingness this could have a negative impact on their learning and cause them to feel marginalized. The concept of marginalization is the perception that an individual does not matter and feel insignificant to others, they experience feelings of isolation and vulnerability (Schlossberg, 1989). They do not feel like they matter or belong and possibly feel lost (Schlossberg, 1989). Marginalized individuals or groups have the perception that they do not fit in or belong (Strayhorn, 2008). Many of the participants who contributed to this study fit the characteristics of marginalized individuals in the higher education setting because they were African American, Latina, women, first generational, or poor. The participants in this study represents a population of individuals who are underrepresented in the higher education setting as well as the science educational and professional communities. The feelings of existing at the margins were a reality for them because they were different from the traditional student population and required the support of the college community to be successful.

The data gathered from this research revealed that institutions of higher education must implement policies and practices to help all students feel like they belong regardless of their race or gender. Administrators, faculty and other agents must promote services that encourage all students to become more involved, motivated to learn, and achieve their academic goals. All students, especially, students from marginalized groups want to be treated equally, fit in, belong, and be supported with equity.

Interview and Focus Group Similarities

Over a three-week period, the researcher conducted five focus groups, four participants in each session. The researcher developed the focus group protocol that was used in each of the sessions. See Appendix E for a copy of the focus group protocol. Each focus group lasted approximately 60 minutes, was audio recorded and transcribed. A total of 20 students participated in the focus groups. 12 African Americans and 8 Latina undergraduate women. They represented a variety of majors in the science discipline.

Across the eight interviews and five focus groups there were several common themes that emerged. These themes proved to be important categories to describe, compare and explain. These themes were also given to participants to review and submit comments during the data analysis process of the research study. There were several themes these were the top four that permeated through the interviews and focus groups: isolation in the science campus community, positive attitudes about achievements in science, dealing with negative perceptions and faculty interactions.

Isolation in the Science Campus Community

Comments relating to the *isolation in the science campus community* theme focused on the feelings of isolation and loneliness; thoughts of being an outsider, being the only African American or Latina women in the class, and the need to have peers, a

sisterhood and role models in the science campus community. Some participants reported that the classroom and laboratory environments were places of alienation with limited connection to peers and faculty depending on the major. The participants felt they were out of their comfort zones in the presence of peers as some peers were not as welcoming as others. When interacting with White female students, participants voiced concern about joining study groups and out of classroom academic activities. Participants who interacted with White female students in the living learning communities often found themselves left out of discussions in the residence halls. African American participants reported having negative perceptions about White peers in the science campus community.

Some participants described how they were excluded from study groups, experienced isolation, treated as outsiders, and were avoided by White peers in the laboratory and classrooms which contributed to their diminished sense of belonging. Some participants also used peer activities such as Teaching Assistant and Learning Assistant positions to gain a sense of belonging in the science campus community. While other participants knew they could be successful in the science campus community despite feeling like they do not fit in with peers. They knew they were smart and would not allow fear to hinder them, as failure was not an option even though they were expected my others to fail and not continue in the major. Participants made a promise to stay in the science major, even though other friends changed their interest. Most of the participants felt strong about being successful in science, they held high expectations for themselves, which included many short term and long-term goals on pursuing a career in the science career field.

Some participants reported having difficulty adjusting in the science campus community once they completed remedial courses as the other peers in the cohort had already completed introductory science classes causing them to feel isolated and alienated from peers. They reported having trouble fitting into already established social groups and friendships in the science campus community. The participants reported that some students established study groups during their first science course in their first semester while taking introductory courses. Many of the participants were unable to join those groups.

For example, here is how participants described their experiences pertaining to the theme isolation.

Macy a Biological Science major stated:

> So I'd rather be excluded for being smart rather than being excluded because they think I am stupid. I don't think they will ever really accept me.

Millie an Exercise Science major stated:

> I'm the only Black person in a lot of my classes…the White people and Asian people all hang out together. Even outside of the sciences, it's hard to find a group where there's a mix of people, because everyone still wants to hang out with their own group.

Lynn a Meteorology major stated:

> The professors know my name from I guess the way I come into class and I sit in the same seat and they know I am the only black girl in the class. I am also the only Black person in the living learning science community…I was known as "the Black girl" no one ever called me by my name. So then I would just not hangout with anyone on the floor.

Several participants reported walking into classroom and lecture halls during the first few days and look around to count African American or Latino faces. They reported feeling comfortable sitting next to others who look liked them if they could find

someone. Many expressed frustration about not seeing professors who look like them or having a critical mass of African American and Latino students in the science discipline to learn from. Many have become familiar with being the only African American or Latino in the classroom or laboratory.

Social isolation from peers can have damaging effects on African American and Latina students in the science campus community. The effects of isolation on these individuals can be long lasting and create a problems that cause minority student to leave the science discipline. This is consistent with the findings of Barker, McDowell, & Kalahar (2009) who found that student- interactions was the strongest predictor of intention to stay in the major. In their study students who were able to establish strong peer networks in their academic major were those students who persisted in the science and technology discipline. Barker et al., (2009) found that students who formed a peer network in the major were less likely to feel isolated from peers in the classroom and laboratory. Additionally, students who formed peers network also had positive perceptions of the classroom climate and opportunities for collaborative learning throughout the science discipline (Barker, McDowell, & Kalahar, 2009).

There were several participants who expressed feelings of isolation however, they offered much needed solutions to address the issue. For example, participants felt science departments should offer small programs, events, and workshops that encouraged faculty and students in the science discipline to socialize outside of the classroom. This would allow students to communicate with faculty and meet other students who they would not normally interact with in the classroom. Additionally, students would experience more social support from the major department staff, faculty, and other student peers.

Another solution from the participants to prevent isolation was to develop a beginning of the semester orientation for science majors to encourage direct communication between faculty and students as well as between students and peers. Participants thought this event and could provide another way to ease the tension between faculty and students and their peers. Participants felt that having connections to the faculty could address some of the isolation many experienced in the science campus community with other peers and students. Many participants expected faculty to be a conduit to assist students in communicating with the larger major department.

Resilience in science. The *resilience theme* related to participants who took pride in being members of their respective science majors; proud to be students at the university; and pleased with their science academic endeavors. Participants reported that they were pleased with their accomplishments this far in the major. Those who successfully completed the organic chemistry requirement voiced appreciation for remaining in the science campus community after taking this course. Other participants reported being excited about remaining in the science campus community despite the negative experiences that diminish their sense of belonging.

For example, a participant from the focus group described how proud she was as well as her peers who were pleased to discover she was a science major. As many dropped out of the science discipline, these participants reported how proud of themselves they were for staying in the science major.

Lauren a Marine Biology major stated:

> There are a lot of minorities in the beginning and then they start to drop… yes that happens for other races and nationalities too, but for like Blacks and Hispanics, we are already a small number, like it's very obvious when we leave the major. I don't know how many people I know left but I could see probably like dots of us

> in the large lecture halls. I am proud to say we stayed *(pointing to other participants in the focus group).* …We all go into a science lecture hall and look to see other Black and Latino's, I know I do it!

Tina a Biological Science major stated:

> When people see you, your peers especially like from your kind they are really proud of you, you know. They are happy to see one of us in the major since there are so few of us there.

Another participant spoke of the value she believed she brings to the science campus community. This value she held in the community was what made her proud of herself and the knowledge she had acquired. She talked about how assisting others inside and outside of the classroom with course work was what made her proud. She repeatedly mentioned that her peers from others science disciplines were proud of her for studying in a science major.

Lilly a Biological Science major stated:

> I just feel valued in a way because I am able to answer their questions and they are able to understand the coursework, ok, this is how you solve it. So I have something valuable to show them in a sense, so I guess in that way I feel valuable to my peers and even like with my friends. I just like the encouragement that they give me and they are saying, oh, I am so proud of you for studying science and staying in the major now that I am a senior in that sense. I do feel valued.

Another participant also spoke of how proud she was about completing a science degree program as a senior. She was proud as others might be in culture shock for seeing minority faces in the Biotechnology major.

Interview participant stated:

> I'm very proud… I am one year towards the end, but at first it's of course very scary, it's very overwhelming just in general. I think for many it's kind of like a little culture shock because they don't see that many of us here, they are not used to it. I wouldn't want to say that it's just based on skin tone because there's, many Asian populations that are also in the sciences, but I think it's how we look.

One participant felt proud to be valued for her race. She mentioned that her race was being accepted by the institution to assist minorities in obtaining degrees in science. As the university is encouraging minorities early on in their college career to consider professional and graduate school.

Lizzy a Biological Science major stated:

> I feel like, my race is valued in the research community a lot more because this university is now providing the support for minority people that want to go to graduate school and get their M.D., Ph.D.'s, which is something that's really hard, and takes a lot of effort and time to do, and just having that support now is great, I feel like it's so much more beneficial to start early on versus later.

A very important pattern that emerged from the focus group data was that many of the participants held positive attitudes of pride and resilience about studying in a science discipline as well as being proud of their academic achievement in the science campus community thus far. This was consistent with the finding of Else-Quest, Mineo, & Higgins, (2013) who studied math and science attitudes of achievement. In their study women reported having more science value. In this research study having attitudes of success were strong predictors of achievement in science and math disciplines. Additionally, the researchers found that improving attitudes in science and math disciplines were particularly relevant to women and minorities groups that have limited educational opportunities in science and are underrepresented in science related career fields.

Focus group participants also reported that the minority science program also encouraged positive attitudes about achievement in science. This was also mentioned in the one on one interviews and narratives. The minority science program provided a safe haven instead of a hindrance for the participants in the study. In both focus group

sessions and in several interviews the participants described the minority science program as a resource where they could depend on other students in their respective science majors. Support included, advanced peer tutoring, supplemental instruction and group study sessions. Additionally, participants were provided opportunities to foster relationships with other minority groups. The participants expressed relief to be a part of a welcoming and accepting environment that motivated them to attend class, study productively, and feel good about their decision to major in a rigorous department. They reported that the minority science program was a place where they could exhale and openly express some of the issues and concerns they experienced in the science campus community. The program served as a place of comfort for participants as they continued to utilize the resources throughout their academic journey.

Dealing with negative perceptions. The *negative perceptions theme* related to participants receiving negative stereotypes about their academic abilities from faculty and peers, judgment of their intellectual capacities, negative comments about achievement, dealing with incorrect observations, how they are less likely to be successful because of race and gender, and battling with ethnicity in the science campus community (Hausmann, Schofield, & Woods, 2007). These negative comments of how faculty and peers view the students have hindered many from reaching out for help (Seymour & Hewitt, 1997; Steele, 1997). Coming from urban high school environments where these participants were at the top of their class rankings in math and science. Participants reported being under pressure to prove their intellectual abilities even though they may have demonstrated high achievement in high school, on SAT's and college placement exams.

A few participants were both angered and surprised which caused their sense of belonging to diminish (Hurtado & Carter, 1997; Johnson et al., 2007). They found themselves in an environment where they were in a no win situation. They felt like they were expected to be unsuccessful academically without being given a chance because of their gender and ethnicity.

One participant was disappointed with her White peers from high school because they were shocked about her decision to major in a science discipline. She expressed frustration as they did not think she was committed to such a rigorous major.

Belle a Biological Science major stated:

> So, your friends who are not a science major they don't really understand what you mean, when you say that studying science is hard. I know I do remember the hardest thing was when my White friends from high school found out that I was a science major. They were shocked. They asked if I was serious. I didn't think this was funny.

Another participant was upset with her peers from the residence hall, as they were also shocked that she had completed both Biology and Chemistry and was now in the Organic Chemistry course. She was also frustrated that she was not taken seriously.

Sydney a Biological Science major stated:

> When I told a few friends I was in Organic Chemistry they couldn't believe it. I am upset that people are shocked that I consider myself science worthy. I can do this science thing. Why is it that Latina women are looked as people who shouldn't study science? What is the shock all about? Yes, I know the major is really hard but that doesn't mean I am not capable of being in the sciences because it's hard.

Kathy, discussed how these negative perceptions of her being Latina in science reminded her of her childhood. She is sad when she realized that these negative thoughts and beliefs are still present in her life at the college level.

Kathy a Bioenvironmental Engineering major stated:

> Just growing up Latina I think I remember where people say you can't be what you want to be because you are Latino. I don't think it is right to mess with people's confidence levels especially at the college level. I still believe that I can do and be whatever I want to be especially if I work hard enough and that is what I wanted to do when I came here. I wanted to work hard to change what others have said to me because I am a Latina.

Several participants in the study experienced working in a research position beyond their lab courses, which assisted in developing sense of belonging in the science campus community. Some participants were assigned to research laboratories after requesting a job through the student work-study program. While others, were offered positions in the laboratory through invitations from faculty members in the classroom or from recommendations by their academic advisors. The participant's experiences in the laboratory varied amongst the participants.

Many participants felt like they belonged in the laboratory setting but took some time before they could relax and be comfortable in the laboratory and with members of the community. For example, the participants expressed concern when they first joined the laboratory, as they felt intimidated by the environment. For most of the participants this was their first semester on campus and the first time they had encountered an authentic research laboratory. The participants described their high school laboratories as classrooms, which were very different from the college lab. The participant's also described feeling nervous about making a mistake or not being able to understand the complexities of the research. Some reported feeling like much of the laboratory work reminded them of learning a new language, which made them fearful of the opportunity. They were also worried about not fitting in as they were most likely the only African

American or Latina in the lab, participants continuously reported that many peers who they began the science major with has dropped out after their first year.

The *dealing with negative perceptions* theme closely related to the *overcoming stereotypical barriers* theme as the participant's reported being frustrated about participating in classroom laboratory where they were grouped with peers who did not want to work with them or who questioned their academic abilities because of their race or gender. This caused some participants from both the focus groups and interviews to question their membership in the science campus community. The participants often reported they had to prove themselves in the classroom with each science class they enrolled in at the university. With each passing semester they had to prove their academic abilities to peers and faculty. However, with time most were able to fit into their individual lab communities and classrooms to gain a sense of belonging with the faculty and student researchers. Participants reported putting their fears aside and trust that they could become a part of the team. Additionally, participants reported that faculty and lab principal investigators (PI) were instrumental in helping them develop relationships with other lab partners. When assigned lab projects participants were encouraged to work closely with the laboratory team.

Both focus group and interview participants offered solutions to developing strategies to assist students' in belonging in the laboratory community. This included, assigning roles for the team so that all team members participated, attending scientific conferences together as a team, having lunch together, listening to one another while in the lab and having conversations about each other's culture, interest and talents. These

solutions would allow participants to learn more about each other as they worked together in the laboratory setting.

Faculty interactions. The faculty *interactions theme* related to participants who took it upon themselves to reach out to faculty for assistance. Participants in the focus group reported that they made an attempt to reach out to faculty for help with course work and academic advisement in the science major. Many participants in this research study that reached out to faculty reported feeling a sense of belonging in the science campus community much quicker than others who did not reach out to professors. These were also many of the same participants who had high confidence levels regarding their academic intellectual abilities. Hurtado, Cabrera, Lin, Arellano, & Espinosa, (2009) posits that despite the fact that students expressed interest in science before entering college few were aware of other non-traditional science related career options. Participants in this study reported gains in learning about career options in science through their constant interactions with science faculty.

Participants also reported that many White faculty members continuously reminded them of the possibilities to obtain acceptance into graduate school as well as receiving scholarships, assistantships, and grants because of their interest in a STEM discipline due to their race and gender. Participants appreciated the advice, however, many participants wanted their intellectual abilities to speak for their achievement versus their race and gender. They expressed concern especially when faculty mentioned race.

Lastly, participants reported that having conversations with faculty provided them with options to consider in science. Some participants reported that faculty were interested in their career aspirations after graduation. By having conversations with their

faculty, participants in this study were exposed various science career options and as a result may be more likely to go into the science field after graduation. This is consistent with the finding in Hurtado, et.al, (2009) where the researchers found that collaborative relationships with faculty existed in a variety of circumstances. Participants in this study reported having a relationship inside and outside of the classroom. These collaborative relationships with faculty assisted students in creating a learning environment for all students.

Chapter Summary

The findings of the research study were presented in this chapter. Narrative text assisted the researcher in understanding how participants told stories about their lived experiences. This chapter presented the narrative text through audio recorded semi-structured interviews and focus groups. Using the hermeneutic process the interpretation and analysis of each narrative was presented. Each narrative interview allowed the researcher to reflect critically about what participants said about their experiences of being an African American or Latina women in the science campus community. Additionally, a summary of the procedures used to conduct the focus groups was presented. The focus group responses from the twenty participants were documented. The common themes amongst both the narrative interviews and focus groups were presented and discussed. The participant responses developed themes that were analyzed and discussed. The research questions provided the framework for noting and organizing the data. The responses gathered from the focus groups were used to emphasize the participants' perceptions of the three research questions. A summary of the research

study, discussion, leadership reflection, implications for practice, recommendations for future research and conclusion are presented in chapter five.

Chapter 5

Discussion, Implications and Conclusion

Having a sense of belonging produces many positive outcomes including building positive relationships with peers, faculty, and other agents in the campus community. When these connections are combined with a support system they inspire an encouraging relationship in the campus community and can have a lasting impact on academic outcomes and persistence. When students do not have a connection to the community and lacks belongingness this could have a negative impact on academics, these students often leave the science discipline (Strayhorn, 2012). Students who experience a lack of belonging they are less likely to have a connection to other peers and faculty in the science campus community.

This study explored the personal narratives of African American and Latina undergraduate women and their sense of belonging in the science campus community. The narratives provided a connection to the personal experiences of each participant. Each narrative also gave a voice to the individual participant and empowered her to express herself through her stories. This chapter will provide a summary, discussion, leadership reflection, and implications for future research and will conclude with a chapter summary.

The purpose of this qualitative study was to explore the sense of belonging of underrepresented African American and Latina undergraduate women in the science discipline at a large northeastern public research institution. This research study detailed the experiences of cohesion and fit that describes African American and Latina

undergraduate women sense of belonging in the science campus community at the higher education level.

The study was guided by the following research questions: 1) How did African American and Latina undergraduate women describe their sense of belonging as it related to their academic and social experience in the science campus community? 2) What factors contributed to African American and Latina women being engaged or disengaged in their science campus community? 3) How did ethnicity and gender influence their sense of belonging in the science campus community?

The literature reviewed for this research study showed that undergraduate women who have a sense of belonging at post-secondary institutions are more likely to persist toward graduation in a science major. For African American and Latina women in particular the literature provided insight into their sense of belonging and showed that success depended on if the student felt welcomed by the campus climate. The findings highlight the importance of having a sense of belonging in the science campus community. The literature covered sense of belonging among undergraduate students, retention and persistence in higher education, campus climate, and ethnicity and gender of minority students. For this reason, I began this study with an interest in the educational experiences of African American and Latina undergraduate women's sense of belonging in the science campus community. The narrative stories in this research study highlighted the meaning each participant revealed about her lived experiences. The goal of the research was to investigate the sense of belonging of African American and Latina women in the science campus community. This study found that women of color would

be more encouraged in their pursuit of studying a science discipline if they had a strong sense of belonging in the science campus community.

Discussion

Sense of belonging has been noted as an important factor in educational retention models and has gained momentum in the persistence and retention literature. This study highlighted the importance of building a sense of belonging for minority students in the science discipline. All college students, and most specifically those from marginalized groups engage and perform academically well in educational environments where they are valued and accepted as an individual (Strayhorn, 2012). Helping these individuals build a connection may be an important factor in promoting academic achievement in the science discipline.

The sense of belonging framework addressed the membership and connection these women needed in the campus community to be academically successful in the science discipline. The framework also addressed how belonging encourages independence, self-determination, motivation, acceptance and inclusion all of which each participants described in the focus groups and narratives stories.

From the data collected we learned how difficult it can be to sustain academic engagement and commitment in an environment such as the science campus community where African American and Latina undergraduate women often times experience not feeling valued or welcomed (Tinto, 1997). The data also expressed how sense of belonging played an important role in the retention and persistence of minority students (Strayhorn, 2012). Research shows that sense of belonging in undergraduate's leads to higher levels of involvement on campus, lower levels of depression for African America

students, and higher levels of academic achievement (Freeman et al., 2007; Hurtado & Carter, 1997).

In this study participants were challenged and judged about their intellectual and academic abilities based on their race and gender. The participants described how they felt less confident in the classroom when their learning styles or strategies did not match the professors and peers. One of the most important points that emerged from the data and literature was academic preparation before entering college and how it impacted the participants in the study. For majority of the participants their academic preparation from high school in math and science did not properly prepare them for the rigors of the college classroom. Many of the participants were from inner city high schools where advanced courses in math and science were not offered. Academic preparation proved to be a major factor when describing their sense of belonging in the science campus community.

Participants also described the pressure they felt to "prove" their academic intellectual abilities to their peers and professors semester after semester in mathematics and science courses. They described different experiences that made them feel uncomfortable when searching for peers to form study groups. They also described feeling uncomfortable working in groups in the laboratory, even when the faculty members organized those groups. Their narratives expressed the excitement participant's felt when they proved students wrong in the labs and classroom settings.

Collectively, these experiences challenged their sense of belonging in the science campus community. Some participants questioned their connection. Many found ways to cope with the negative experiences despite the internal stress they endured. They

described how support from family, minority peers, the learning center, and faculty assisted in their academic achievement. Many participants credited the assistance of the minority science program for making them feel like they belonged. They described how important it was to have minority friends outside of the science and math classroom. Many described their experiences of belonging as rewarding. Overall, they were excited to call themselves soon to be researchers, scientist and educators.

There were several themes that emerged in the study that demonstrate how the participants described their sense of belonging in the science campus community. The major themes that were present are as follows: *Sense of Belonging in the science campus community, Support Systems, Academic Challenge/Struggle, Overcoming Stereotypical Barriers, and Faculty Interactions.*

Research Question 1. *How did African American and Latina undergraduate women describe their sense of belonging as it related to their academic and social experience in the science campus community?* Strayhorn (2012) posited that sense of belonging matters and all individuals want to fit in and connect with others. Sense of belonging is also determined by the quality of relationships an individual has with faculty and peers in their learning environments (Strayhorn, 2012). When participants felt their relationships were positive and motivating they were more likely to feel a strong sense of belonging. While, students who identify these relationships to be negative and less supportive, they are less likely to experience a strong sense of belonging. Belonging requires individuals to have enough in common to find community. Many of the participants in this study voiced a need to find a sense of belonging in their science

communities. According to Hausamann, et al. (2007) students with a strong sense of belonging are more likely to persist at their institution of higher education.

Macy, a Biological Science major, arrived at the university excited to learn from the science community.

Macy stated:

> I was excited to go to college I wanted to learn from everyone on campus. I was placed into a science class in my first semester that was amazing. But once I started to slowly interact with other students in class projects I soon learned that it was more of a competition then I originally thought. I learned that people think I am really stupid and it is so funny because I am that type of a person that hates group projects. But I feel like as a Black woman others have the stereotype that I am lazy and people think I am stupid, I kind of have to take on more and then it gets to a point where now they are taking advantage of me. So it is kind of a lose-lose situation where at first they think you are dumb and then when you finally prove it to them which I constantly feel I have to prove myself not because like you should just be confident in yourself but because if you don't people will think you are stupid. It is so complicated, it is stressful, like that's the most stressful part like knowing what you are doing but then having and prove that you are not the person that is the free loader but then now that you have proved it, now all the free loader are coming to you. It is really not good, it is really stressful and it happens in all my science classes.

Macy described in her narrative her excitement in the science campus community was short lived. She was met with challenges to connect with other peers and faculty in the classroom. Macy experienced isolation from her White peers in the classroom and laboratories, and when working in groups which caused her to question if she belong in the science major. Macy indicated that she was negatively stereotyped by her White peers as being lazy, stupid, and dumb even before she was given a chance to demonstrate her academic abilities. Macy felt like she had to succeed and prove to her peers that she was a smart African American women who was capable of majoring in science. She expressed how she felt she was worthy of respect and acceptance in the science classroom from her

professor and peers. She also expressed concern for the large lecture halls that prevented her from getting to know her professors.

Christy also had a tough time connecting to peers and faculty in the large style lecture halls she stated:

> Many of the classes like bio, chemistry, and organic chemistry are large they are very large classes. There are four hundred students per lecture so, you are competing for time one on one time with the professor that you're not going to have because there's all these other students. So, instead of going to the professors I tried other resources. So, I went to late night study sessions from the TA's. I had more encounters with the TA's than the professors in those large classes for a few semesters this is why I believe have no connection to my science faculty.

For many of the participants there were several encounters with peers and professors that caused them to voice concern about finding enough in common to build a community to belong. The research suggests in order to have a sense of belonging each individual's differences must be celebrated and these differences must be noted as contributions to the community not deficiencies (Hurtado & Carter, 1997; Strayhorn, 2012; Johnson, 2012). Macy and Christy's experiences are great examples of individuals whose contributions of being African American women in the science campus community were neglected. In addition, their lack of connection to the community seemed to have caused them to feel isolated from the community (Strayhorn, 2012; Johnson, 2012). The findings from these two participants are similar to the current research. Both participants have experienced less supportive environments where negative stereotypes have hindered their performance and low levels of academic confidence reinforced feelings of not belonging (Seymour & Hewitt, 1997; Johnson, 2012).

Pamela and Lizzy reported feeling a strong sense of belonging in the science campus community after being recruited to become an academic tutor and peer mentor. Pamela stated:

> I feel like I fit into the science community when I'm like teaching or tutoring, so a lot of students look up to me like oh, look she's a Chemistry major, she can do this, she can help me, and maybe one day I can be that successful in chemistry too.

Lizzy stated:

> Some resources that I have used to assist me in feeling a connection and belonging to the science major was first living in an all STEM female dorm my freshman year which exposed me to an environment that helped me focus and also connect with other STEM female majors. I've also tutored and mentored other African American girls in the living learning community who are science majors. Mentoring makes me feel connected to the other students in the sciences it is a sisterhood that we developed. We help each other feel more confident at times when we are not sure about our course work.

Both Pamela and Lizzy felt peers who they tutored or mentored celebrated their contributions in the science community. Pamela felt a sense of pride when peers inquired about her major and academic accomplishments as she tutored them in Chemistry, Biology, Physics and Mathematics. Lizzy became a tutor to her peers while living in the minority women in science living learning community. She described her experiences with her peers as a "sisterhood". She felt encouraged by the other women to succeed, which increased her sense of belonging.

Amy also voiced motivation in the science community as a teaching assistant with the university-learning center.

Amy stated:

> I gained my motivation and aspiration of succeeding in my major from tutoring and teaching others at the learning center. Yeah it definitely came from being an LA (learning assistant). This job is really one of the most fulfilling jobs I've ever

> had because I've never had the opportunity to be in a position to teach. It challenged me to learn more about physics and understand the material. Tutoring gave me pride. I felt good about helping someone. I liked that I was actually helping someone learn something new. There are times when my students express appreciation for my help. I remember a time when a fellow Black girl said I was an inspiration to her, she said, "I've never seen a black woman any of my classes like teaching." After that I was like I can really do this. I feel like I can really be a change agent. I want to be a professor and show other Black girls or minority girls like you can do it too you just have to put your mind to it. And it's true because I never had a Black female professor in science, ever. I remember maybe like in elementary school.

Research shows that students who participated in learning resource centers on campus as tutors and mentors are more likely to feel a stronger sense of belonging in their college communities (Noll, 1997). Collectively, each participant described how feeling successful in the classroom increased her sense of belonging. When the participants felt like they belong in the science campus community it enhanced their academic confidence. They were even willing to take academic risks, such as adding more tutoring employment time to their busy academic schedules to achieve the feeling of belonging.

Research Question 2. *What factors contributed to African American and Latina women being engaged or disengaged in their science campus community?* Many of the women in the study were interested in science majors as a way to use their academic abilities to help others and work with people by studying in the educational or medical field. Pamela and Amy expressed how much they loved science and were adamant about enrolling in a college science major as high school students. According to Hazari, Sadler & Sonnert, (2013) women are more likely to pursue majors that fulfill interpersonal and common goals. Choosing a science major allowed Pamela to express her love for science as well as her desire to help educate students about Chemistry.

Pamela stated:

> Sometimes I find it hard because I look around and I'm the only Black person in my Chemistry classes, and I'm just like oh, great. The students recognize me, but they probably don't know my name. But that's ok because I really want a Chemistry degree. I love science I have ever since being a freshman in high school. I really want to teach Chemistry to high school students, possibly college students. That's just the type of person I am, like I want help in the classroom. I started tutoring as a TA, went into study groups to help others learn a love for science which is basically pushing me towards more teaching, and recently I started doing research in a lab, so that's pushing me towards working in a Chemistry lab after graduation. Right now we're working on a small molecule project where we're basically trying to find this protein that inhibits the food virus. So, we're just building a bunch of compounds that we send to the cancer institute, so they can use it. All this helps me want to learn more science I feel like I continue to love it because of my experiences.

Pamela selected a White, male-dominated competitive major. She knew from her first semester that she would face many obstacles in the classroom as she often found that she was the only African American student in many of her required Chemistry courses. However, she continued to stay passionate because she wanted to one day teach Chemistry to high school or college students. Her work in the lab and her tutoring experiences motivated her to peruse a degree in Chemistry.

Amy also loved the science discipline. She enrolled in a major that was heavily populated by White males and has been successful in her academic pursuits so far, outscoring many of her peers in the major. Her love for science allowed her to take on a research project in the laboratory to help build her academic abilities as well as gain a sense of belonging in the science campus community. Since finding her interest in Environmental Engineering she has been motivated to change what others think about preserving the earth and to show urban communities that environmental issues are important.

Amy stated:

> I actually, sincerely love the Animal Science major that's is why I am committed to it. I couldn't see myself doing anything else. I don't have a plan B as much as I like I won't say if I don't do this I will just do something else but it's not what will make me happy in the end. I fell in love with the science curriculum they have here. It was meant to be really good and because they had a farm and I never had farm experience so like I felt that would be really nice thing to have, going into vet school because not lot of people have large animal experience. I have also been doing very well in all of my courses.

Both Pamela and Amy knew they wanted to study in the science discipline at an early age, their interest in science started before college. They selected a science major to secure their own futures. Their commitment and passion for science grew as they successfully completed one class after another.

Faculty members at post-secondary institutions can be those individuals who fulfill the student's fundamental need to belong (Glass, Kociolek, Wongtrirat, Lynch, Cong, 2015; Strayhorn 2012). Quality faculty connections shape the students perception of their professors as being welcoming, respectful, and available for frequent interactions inside and outside the classroom. Students who have these types of connections to faculty and staff on campus are also more likely to report being confident of their academic abilities and drive to succeed (Komarraju, Musulkin, & Bhattacharya, 2010). As the in the case of minority students faculty interaction can provide these students with much needed support, motivation, and guidance (Lillis, 2012). For example, according to Glass, et al. (2015), students who ask for advice and guidance from faculty about academics and social concerns are more likely to develop a stronger sense of belonging.

In their narratives Macy, Amy, and Pamela reported that they frequently visited professors for assistance and direction regarding academics. Macy visited her faculty office hours even when she felt she was preforming well on the exams. She felt uncomfortable at first but pushed herself to continuously make an effort to visit the

faculty. She went to the faculty office hours to ask lots of questions. Macy wanted the individual attention she was unable to get in the large lecture hall. Attending faculty office hours provided a way for Macy to interact and build a rapport with her science professors many who she thought held negative stereotypes about her abilities initially.

Macy stated:

> When I go to office hours I'm mostly proving myself because some of these professors they also have their stereotypes, but when you go to the office hours and these professors know who you are and know your name and they wave to you, when you just see them. I feel like I belong, I feel like the faculty has accepted that I am a force to be reckoned with. Visiting the professor during office hours makes your learning experience so much better if you know the professor versus if you continue to just kind of be in the background. When it comes to the time when you really need to ask questions you won't feel comfortable. So you may as well feel the professor out from the beginning. I learned from my experience if you go and you get on your professor's good side and he sees you thinking critically in front of him, going to his office hours and asking him questions and showing interest in the subject that he teaches, he knows that you are capable of good work obviously.

Similarly, Amy was able to build a relationship with a faculty member from her laboratory. Her interaction with the faculty started with a casual conversation about why she chose to study in the science discipline. The two of them began to talk regularly and the faculty member invited her to become a research assistant. She described it as a perk to being an African American woman in a science major. She also described how the professor acknowledged her academic abilities, which helped her, feel comfortable. He sought her out to participate in a research project.

Amy stated:

> My research lab faculty member actually helped me get into the research assistant program next semester. He really wanted to see me advance– because I'm the only black woman in the entire building. So he really wanted to see me stay in the lab, like he wanted to see me excel and get published in like a science magazine. I don't know if I can do all this but like he really saw something in me

> being the only black person like in the entire building and I wanted to learn from him so that contact with the faculty was helpful… that was a perk.

This is in contrast to Christy who had fewer interactions with faculty. Christy was disengaged she experienced minimal interactions with faculty inside the classroom and had little to no interactions with faculty outside of the classroom (Komarraju, et al. 2010). Christy struggled to maintain relationships with faculty. She felt her professors were less interested in her learning and progress in the classroom, as a result Christy showed less confidence in her academic abilities (Johnson, 2012). In the case of Kelly she was intimidated by her faculty members, she also had little to no interaction outside of the classroom. Kelly reported feeling dumb when asking faculty for help at office hours. She expressed difficulty relating to faculty in her science major because of her race.

Kelly stated:

> Um well I feel like, we have all reached like a limited amount of knowledge you know, so I guess because that the faculty knows so much more than I do I feel like I am easily intimidated a bit, nor do I want it seem like I'm dumb, you know. I also feel like it's hard to relate to the professors as I am a Latino I don't know what they are thinking of me.

Not all of the participants thought faculty interactions were important some believed they could be successful without connecting to faculty inside or outside of the classroom. These participants found different ways to navigate their academic paths with the help from other resources on campus. One common resource shared by majority of the participants was the minority science program. The program recruits African American and Latino science students majoring in science and provide them with additional enrichments beyond what is offered in their large introductory science classes. The participants mentioned the support and motivation of this program during times when they did not feel comfortable approaching faculty for help. The participants used

this program to replace interactions with faculty in their science major departments. They found the staff and other African American and Latino peers to be caring and supportive of their academic experiences on campus. They felt like the staff and fellow minority students created an environment where African American and Latina women fit in and belong. According to Goodman, Baxter-Magolda, Seifert, & King (2011) "…students appreciated interactions with caring faculty, staff, and peers who supported them in transitioning to college learning and the university community" (p. 8). The participants used these relationships to build a supportive network outside of their classroom interactions.

Research Question 3. *How did ethnicity and gender influence their sense of belonging in the science campus community?* As participants developed and learned more about their interest in the science discipline they constructed personal identities within the context of their environment. Their gender and ethnicity was defined by their experiences in the science campus community. This included their relationships with faculty and peers as well as the actions and responses of those individuals. When the participants had positive experiences they felt important, appreciated, and confident which gave them a sense of belonging. Having a positive sense of identity was essential for many of the participants, they felt supported as their academic confidence grew. They were motivated to explore and learn outside of their comfort zones. Caroline & Johnson (2007) reported that minority women of color required recognition and praise from faculty, staff and peers in the campus community.

However, when those experiences were negative they expressed feelings of isolation and doubt. Christy, a Nutritional Science major, expressed that she was treated

unfairly by peers in the laboratory because of her race and gender. She related the following experience:

> I took physics lab and I had two male partners for a lab assignment. Due to my lack of confidence in my answers even when my answers were right they never regarded them. It was just 'oh' you know and then later on when the TA says, these are the correct answers these are right, then it's like oh' she was right, but they stayed quiet and wouldn't admit I was correct. That made me feel frustrated, one I look at my color first before I look at me being a women. I look at my color and oh, you think because I'm Black that I don't have anything to contribute and then secondly being that they are males I look at me being a female. I'm quieted down that kind of thing.

Christy felt uncomfortable in such a competitive environment, which caused her to question her sense of belonging. Christy expressed concerns with fitting in because of her lack of confidence in herself and her academic abilities as an African American woman. Christy had an encounter with two male students in the laboratory that made her feel isolated and excluded from the science campus community. This experience has stayed with her for a few semesters and as a result she experienced a diminished sense of belonging with her professors and peers.

Jody, an Exercise Science major, expressed how being an African American woman she feels no connection to other ethnic groups in the science campus community.

Jody stated:

> The science environment around here is competitive. Everybody wants the same spot, you know, to be the top student in the class and especially being an African American woman, it's harder for me to get to that spot I just mentioned. So that's why we're kind of forced to have the mindset of looking out for yourself and for your kind. Races stick together around here, from what I've seen it kind of turned me off of wanting to be, I don't know, being in the group, per se. As an African American I don't feel connected to the other groups.

Jody described the science campus community as a competitive environment. As an African American she felt the need to be independent at times but when she needed

help she sought out other African Americans. She described her disconnection to other groups that were not African American.

Several of the participants felt they had to prove themselves as minority women before peers and faculty took them seriously. They expressed how their ethnicity and gender as African American and Latina women caused them to work twice as hard to change stereotypes others had of them prior to being aware of their academic abilities.

Macy, an African American Biology major stated:

> I feel kind of the underdog but at the same time when I prove myself always have to prove myself and when I do I feel I'm getting the wrong type of attention, people start to come towards me I guess in order to leech off of me.

Ana, a Latina Animal Science major stated:

> So it was like I need a step it up and I needed to prove myself but just take charge because sometimes I was just so afraid, because oh, yeah I let my stereotypes of being a woman, a freshman and being Black just hold me back in the lab that semester.

Lauren, an African American Marine Biology major stated:

> I have to prove myself in the research department in general so that professors know that I'm not a minority to get that stigma with a negative background but I am somebody who should be in the sciences who is a good candidate to be in their science lab that's my goal. I feel like I have to do this because I am the only Black person in the concentration right now. I have been told there are Black people in the major but the last one was from 2003 so that's a long time.

Belle, a Latina Biological Science major stated:

> Even the university they don't expect the Latinos and the minorities to do well because of our demographics and background that just makes me want to try harder and to prove the University wrong and show my family I can do this. Because I don't think either understands.

Many participants felt pressured to prove that they belong in the science campus community, by working harder to show faculty and peers they were smart. Some

participants studied harder to continue to get high grades. Other participants used their determination to get high grades in the classroom to prove to faculty and peers that negative stereotypes about her abilities were wrong. Finally, others experienced personal failures that encouraged them to change her academic strategies and prove that they were not what they were perceived to be as African American and Latina woman. These experiences caused the participants to doubt their academic abilities and question if they belong in the science campus community. This is consistent with the research of Fries-Britt, Younger & Hall (2010) who conducted a five-year study of high achieving students of color from different regions of the United States in a science discipline. The students in this study also reported having to prove themselves to faculty and peers in the classroom. The researcher titled it, "the never-ending proving process" (p.79). Their participants expressed anger towards faculty who they had to prove their academic abilities to in more than one course with the same professors and peers. As they persisted into more rigorous courses as each semester passed they had to start all over again to prove they could handle to course work. The student's academic abilities were challenged and negatively judged because of their race and gender.

Mcgee and Martin (2011) studied stereotype management of 23 Black students studying Engineering and Mathematics at four large Midwestern universities. They found that participants in their study made proving their intellectual value part of their academic mission. The students sought out ways to fight against negative bias assumptions others held about their intellectual abilities in both mathematics and engineering disciplines. These included, "avoiding wearing certain clothes that were associated with being threatening, smiling a lot to appear friendly and approachable, excessive nodding to show

they understand the lesson, avoiding questions about their personal life for fear of exposing the racial and class divisions, walking into the first day of a higher level mathematics or engineering class with the book outside of the book bag so hopefully no one would ask "Are you in the right class?"" (McGee & Martin, 2011, p.1370).

The race and gender of African American and Latina women in the science campus community play a major role when looking at how they describe their sense of belonging. When students are judged about their academic abilities based on their race and gender this challenges their connection to the community. As students in this research study encountered these experiences many had a hard time coping with the stress of how to overcome these biases. In spite of the negative environment other students found different was to motivate them in academically achieving their goals. As the research of McGee & Martin (2011) suggest, students must learn to manage the threats in order to persist in the science campus community.

Leadership Reflection

My goal was to create a qualitative project that would capture the voices of minority women in the science campus community. I wanted to use my skills and leadership in education to tell their stories that often go unheard. It was also my goal to use my position in higher education to spark a conversation about the sense of belonging of minority women in the science community. This caused me to reflect on my leadership values and how I could use these values to support the creation of an environment that would enhance or give minority women a sense of belonging in the science campus community.

From interacting with participants I learned that they were eager to tell their stories. Throughout the process they continuously encouraged me to call, e-mail and visit them on campus as they took the research study very seriously. I recognized through me they saw and learned new things about themselves each time we sat down to discuss their experiences. From this I learned that African American and Latina undergraduate women in this study are just as motivated to think and learn in the science campus community as any other individual however, having a sense of belonging in their academic communities will enhance their motivation. Completing this research encouraged me as I am a motivator. I motivate and push others to achieve at their highest potential. My choice to motivate others brings out my transformational leadership style, my reflections of my leadership are found within this framework. Transformational leadership assumes people will follow a leader who inspires them. According to Couto (1993) the transformational leadership style is design to elevate, mobilize, inspire, exalt, uplift, preach, and energize (as cited in Wren, 1995). Transformational leadership gives the follower a sense of belonging. I want people to set high standards and goals in life. I encourage those around me to use their natural talents and experiences to dream big and act on those dreams hoping that one day their dreams will come true. I motivate people to change, improve, and never give up continuing to try despite the challenges they will face.

Leadership is essential to the creation of an environment where students feel they are accepted by faculty, staff and peer in the campus environment. As leaders in higher education we must explicitly create a culture that values the needs of all students, who will in turn respond with their loyalty and commitment to the institution. The stories told in this research do matter and leaders in the community are those individuals who are

needed to push the conversation to all who will listen. The ability to change is the concept that is woven throughout my leadership philosophy. As a leader I hope to change the way I lead in a positive way while having a strong impact on those I lead. I believe it is important for me to apply my core values to my daily decisions and actions. Having these core values of motivation will assist me in transforming others into aspiring leaders.

Implications for Practice

The findings from this research may aid post-secondary institutions in better understanding the experiences of belonging and fit of African American and Latina women in their science campus communities. Faculty and staff members can be critical to fulfilling a students need to belong (Glass et al., 2015). Faculty are important because their presence can assist women in science with creating quality relationships of interaction inside and outside of the classroom. In an effort to address confidence and motivation issues faculty members must create a caring and welcoming environment for minority women in science. Faculty must get to know students to ensure that all students feel, welcomed, safe, and supported this helps create a sense of belonging and shows students that they matter (Komarraju et al., 2010).

Women-only science resource programs can provide academic and social support to undergraduates majoring in science. A program such as this can offer a supportive and inclusive environment to help women make connections in STEM. These networks are needed for African American and Latina women in science who experience a lack of belonging, fit, and cohesion in their science classrooms and laboratories where men are dominate. Female faculty members can serve as advisors in these programs and offer conference, workshops and programming for women enrolled at the university.

Lastly, as African American and Latina women in science are often underprepared students, administration should offer paced courses in advanced science disciplines. Pace courses are those courses that offer extra recitation sections outside of the normal lecture. This learning strategy is normally offered for introductory courses, however it should be considered for advanced science courses as well. Pace courses should be taught by the faculty. Since most science introductory courses are taught in large lecture halls at post-secondary institutions, recitation sections can be broken into smaller sections to allow for a possible one-on-one interaction with faculty and student. In the current study the participants commonly voiced concern over being taught in large lecture halls, which hindered students from getting to know their professors.

Recommendations for Future Research

This study supports the need to further explore research studies using narrative inquiry, to obtain the participants' personal narratives for the thick, rich contextual meaning they provide (Creswell, Miller, 2000). The women in this current study are majoring in science at a large public research university. Further studies exploring the personal narrative of undergraduate African American and Latina women in science majors and how their sense of belonging related to their motivation would be of interest. In this study many of the participants used self- motivation to encourage themselves through tough experiences in the science campus community. This inner motivation provided the participants with strength and will to persist in the science major. Therefore, a future study referencing the work of Deci & Ryan (2000) would provide a framework for studying self-determination and its relation to belonging. Deci & Ryan (200) posits that when an individual experiences three innate and psychological needs such as:

autonomy, competence, and relatedness, they become self-determined and are intrinsically motivated to pursue things that interest them. The relatedness component would be best to study in future research as it refers to having a sense of security and feel connected to others (Deci & Ryan, 2000).

Another recommendation for future research would be to design a study to explore the campus racial climate of post-secondary institutions and how sense of belonging impacts minority student's perceptions and motivation to succeed. The proposed study would entail a look at the environmental determinants on campus, which determine how students describe their sense of belonging based on those factors. It would be helpful to explore how students describe their relationship between collaborative learning environments and sense of belonging on campus (Weinberger & Fischer, 2006). A possible research question for this study would be, "What are the effects of cooperative learning and group work in science laboratories and how does it impact sense of belong in the science community?"

One last recommendation would be to look at the role of student motivation of undergraduate African American and Latina women in science as it relates to their academic success. This study would look at the motivation and social support of minority students in higher education (Dennis, Phinney, Chuateco, 2005). Inquiring about minority students in this fashion conveys the need for academic and social support at institutions of higher education.

Conclusion

The research study on personal narratives of African American and Latina undergraduate women in the science campus community revealed the exceptional and challenging experiences of the participant's as it relates to their sense of belonging. Each participant's story was told with a distinct message to highlight how she made meaning of her experiences. The research also highlighted why sense of belonging is an essential component for the development and motivation of African American and Latina undergraduate women in science. When these women feel a sense of belonging in the science campus community they gain confidence and self-esteem to excel socially and academically. Having a sense of belonging also validated their perceived self-worth to combat fear and doubt about their academic abilities. The sense of belonging framework provided a lens to better understand the experiences described in their narratives. It also provided a way to understand the complexities marginalized groups encounter at the higher education level.

This study is one step in the direction of highlighting the need to improve the participation and performance of science degree attainment of women. Highlighting the experiences of belonging, cohesion, and fit of African American and Latina women in science will bring out interesting conversations for educators and students alike. The findings from this study inform implications for future educational research regarding women, African Americans and Latina's interested in the science disciple. This research study is a step in the right direction towards gaining a deeper understanding about the cohesion and fit of African American and Latina women in the science campus community. It also highlights the motivation and support these women need from faculty,

staff, and peers at post-secondary institutions. It is important to note that faculty, staff, and peers play an important role for assisting these women in the science campus community. When faculty, staff and peers encounter these women on campus they should approach them with a supportive and welcoming attitude. The evidence found would help college administrator's address the concerns African American and Latina undergraduate women have about belonging in the academic community.

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Appendix A

Participant Invitation Letter

Dear Participant,

My name is Jacqueline Moore and I am a doctoral student in the Educational Leadership program at Rowan University.

I am writing to request your participation in a study I am conducting for my dissertation on African American and Latina undergraduate women's sense of belonging in the science campus community. I am trying to understand how these students describe their experiences in the science campus community. All participants with the following criteria are eligible to participate in the research study:

1. Must be an African American or Latina undergraduate Women
2. Must be a Sophomore, Junior, or Senior with at least 31 or more credits
3. Must have declared a science major that requires Organic Chemistry or Anatomy Physiology
4. Must have complete both Chemistry Part I & II and Biology Part I & II
5. Must have a 3.0 cumulative GPA

Your voluntary participation in this research study will include a focus group, a writing prompt, and a one-on-one interview. The focus group and interviews will be scheduled at a time and place that is convenient for your schedule, both will last between 60 minutes and 90 minutes. The writing prompt will be sent to you electronically through email. You will be given approximately one week to return your response to the researcher through email.

Your participation is voluntary and at any point during the study you can decline to respond or withdraw your participation. Your decision to participate or not will have no adverse effect on your relationship or affiliation with the University. There will be no cost to you for participating in the study.

If you have any questions about the study or are interested in volunteering to participate please contact me at: Jacqueline.Moore1@rutgers.edu or 848-932-3515.

Thank you,
Jacqueline Moore
Doctoral Candidate
Rowan University

Appendix B

Recruitment Flyer

Participants Needed for Research Study

African American and Latina

Undergraduate Women in a Science Major

I am looking for African American and Latina undergraduate Women majoring in science to participate in a study about their sense of belonging in the science campus community. The purpose of the study is to explore how sophomore, junior, or senior undergraduate women describe their sense of belonging.

All participants will be asked to attend a focus group, a one-on-one interview, and complete an electronic writing prompt. Your total time and commitment with be approximately three hours or more.

For more information about the study or to volunteer for the study please contact:

Jacqueline Moore at Jacqueline.Moore1@rutgers.edu or 848-932-3515.

Appendix C

Informed Consent to Participate in a Research Study

Purpose and Background

Jacqueline Moore, a doctoral candidate in the department of Educational Leadership at Rowan University is conducting a study on the sense of belonging of African American and Latina undergraduate women who are majoring in science. This study is being conducted as the final completion of the doctoral dissertation at Rowan University.

I am being asked to participate because I am an African American or Latina undergraduate women majoring in science and I am at least a sophomore, junior, or senior student.

Procedures

If I agree to participate in the study the following will occur:

1. I will attend a focus group and answer a few demographic questions about my academic status and myself.
2. I will participate in a one-on-one interview with the researcher, where I will be asked how I feel about belonging in the science campus community.
3. I will complete a writing prompt sent to me electronically and return it to the researcher within ten days after receiving the request from the researcher.
4. I will attend the focus group and interviews in a convenient time and location that is right for me.

Risk

1. All information about me will be kept confidential. The researcher will hold my information in a secure location at her place of residence. All information collected will be kept confidential and my real name will not be disclosed. The researcher will be the only individual who can access audiotapes, videotapes and transcripts.
2. I understand that I am free to decline to answer any question I choose not to answer and that I can withdraw from the study at my discretion.
3. I will be given a pseudonym name that will be used in the study to protect my privacy.

Benefits

There is no benefit for my participation in this study.

Payment/Reimbursement

I understand that there will be no payment or reimbursement for my participation in the research study.

Questions

I have spoken to Jacqueline Moore about the study and feel confident about participating and asking questions if I feel the need. If I have further questions about the research study, I may contact her at: Jacqueline.Moore1@rutgers.edu or 848-932-3515.

If I have questions about participating in the study I should talk to the researcher. If this is not enough I may contact her dissertation chair, Dr. James Coaxum (856) 256-4779 or by email coaxum@rowan.edu

I may also contact the IRB at:

Arts and Sciences IRB New Brunswick
Office of Research Regulatory Affairs, Rutgers University
335 George Street
Liberty Plaza / 3rd Floor / Suite 3200
New Brunswick, NJ 08901
Department Telephone: 732-235-9806

Consent

I understand that participating in this research study is voluntary. I can at any time decline to answer any questions or be in the study. Furthermore, I understand that if I decide to participate or not my decision will have no direct effect on my relationship or affiliation with the university. By signing below I agree to participate in the study.

_____ _____

Participant Signature Date

_____ _____

Interviewer Signature Date

Appendix D

Release Form for Audiotapes and Transcripts

I _____ agree to have my interviews with Jacqueline Moore audio taped and transcribed into written format. I agree that it is my responsibility along with the researcher to make sure the accuracy of the transcriptions.

The audiotapes and transcripts will be kept in a safe and secure location in the Researchers residence until the research is completed. After the research has been presented and complete the materials will be destroyed. I do not require a copy of the audiotapes and transcripts.

_____ _____

Participant Signature Date

_____ _____

Interviewer Signature Date

Appendix E

Focus Group Protocol

Introductory comments:

Thank you all for agreeing to participate in this focus group on your experiences as African American/and Latina undergraduate science major on this campus. I want to assure you that your discussion today is confidential. None of you will be identifiable - nor will this group be named – in any future write up of our research. **Hand out Consent forms**. *I will be recording the session to assure that I get the most accurate representation of your thoughts.*

I have some general questions to prompt the discussion today, but I really want you to think of this experience as a conversation between all of you. I am interested in hearing a wide range of thoughts about your experience. Please feel free to talk to one another, ask each other questions, and even disagree with one another.

Let's do a quick round of introductions. Can each of you tell the group your name, your major and what is your current year at the university?

1. Please describe your experiences as an African American or Latina women in the sciences at this university?

2. What does it mean to identify as an African American or Latina women in science?

3. Tell me about a time when you felt your identity as an African American or Latina women in science was:
    a. valued/appreciated and/or NOT valued by your science peers and professors

4. In what ways have you interacted with science faculty in the science major?
    a. In what ways do you feel the interaction was helpful and/ or fell short in assisting you in reaching your goals?

5. In what ways have you interacted with other students/peers in the science major?
    a. In what ways do you feel the interaction was helpful and/ or fell short in assisting you in reaching your goals?

6. What would you think the university should do to improve the experiences of Women in science majors?

Appendix F

Interview Protocol

Tell me a little about your family background and why you came to this particular university?

What is it like to be an African American woman in the science campus community?

Where do you feel you most belong or feel the safest when you're on campus?

Why did you choose to major in the sciences?

How do you feel about majoring in the sciences?

How do you feel about the academic science community here at the university?

Tell me about what makes you feel connected or disconnected to your major in sciences?

What factors can you contribute to your feeling like you belong or fit in the science major?

What support resources have you sought while in college? Has it helped you to feel connected to the University?

How do you feel about the services offered by the college?

What aspects of your science experience are related to developing a feeling that helped you fit into your major department?

What experiences in the science major make you feel you belong in the major?

Are there any experiences that make you feel like you're disconnected from the science department?

What could the university do to make you feel more connected to the major?

What could the major department do to make you feel more connected to the major?

Appendix G

Participant Demographic Questionnaire

Group_____ Participant No_____

Belonging in Science Focus Group
Date: Time: Location:
Name:
Email Address:
Cell Phone:
Circle your Age: 19 20 21 22 23 24 25
ID:
Class Status: O Second Year O Third Year O Fourth Year O Fifth Year
Major: _____ Minor: (If you have one) _____
Cumulative GPA: