The Career Goal-Setting Processes of Black Woman Engineering Majors

Adrien D. DeLoach

Dissertation submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

In

Higher Education

Claire K. Robbins, Chair

Walter C. Lee

Glenda R. Scales

Gabriel R. Serna

April 28, 2020

Blacksburg, Virginia

Keywords: Black Women, Engineering Majors, Career Goal-Setting, Possible Selves
The Career Goal-Setting Processes of Black Woman Engineering Majors

Adrien D. DeLoach

Abstract

Despite widespread efforts to reduce inequities in the science, technology, engineering, and mathematics (STEM) job market, huge disparities remain for both African Americans and women in those sectors of employment. Extant literature affirms that Black women encounter various challenges when pursuing STEM careers. More specifically, the research on Black women in engineering focuses primarily on their experiences in academia and does not include their experiences as undergraduates transitioning into the industry workforce. To address these gaps in the literature, this study explored the career goal-setting (CGS) processes of Black woman engineering majors (BWEMs) through qualitative inquiry.

Using a phenomenological approach, the researcher implemented a two-interview sequence with five Black/African American women enrolled in their final year of a baccalaureate engineering program at a predominantly White institution (PWI) in the southeast. Possible selves theory (Lee & Oyserman, 2009; Strauss, Griffin, & Parker, 2012) served as the framework for the guiding research questions and interview protocol, which were designed to capture the essence of the participants’ experiences as they respectively engaged in setting career goals.

The findings revealed that the participants’ CGS processes encompassed a series of cognitive steps, which included their thoughts about goal-setting in general, exploring engineering careers, making adjustments academically, finding an area of career specialization, and dealing with anxiety related to the challenges they encountered as engineering majors. In addition, possible selves theory was used to explain how the participants’ understanding of their experiences in current contexts influenced who they wanted to become in future work conditions.
The Career Goal-Setting Processes of Black Woman Engineering Majors

Adrien D. DeLoach

General Audience Abstract

This qualitative study explored the career goal-setting (CGS) processes of Black woman engineering majors (BWEMs). The researcher used phenomenological methods to specifically describe the participants’ experiences as they took part in CGS. Five participants were included in the study who all identified as Black/African American women enrolled in their final year of an undergraduate engineering program at a predominantly White institution (PWI) in the southeast. Possible selves theory (Markus & Nurius, 1986; Strauss, Griffin, & Parker, 2012) helped to guide the main research question and the research sub-questions, which were based on Lee and Oyserman’s (2009) three individual and contextual factors of past experiences, developmental contexts, and social contexts. The researcher conducted two interviews with each of the five participants. The findings revealed that the participants’ CGS processes consisted of several mental steps, which included their thoughts about goal-setting in general, exploring engineering careers, making adjustments academically, finding an area of career specialization, and dealing with anxiety related to the challenges they encountered as engineering majors. In addition, possible selves theory was used to explain how the participants’ understanding of their experiences in current contexts influenced who they wanted to become in future work conditions.
Acknowledgements

First, I give all glory and honor to God for blessing me with the grace and the perseverance I needed to complete my dissertation.

To my parents, my big sister, and my extended family members, thanks for your love and support throughout my doctoral experience. This accomplishment is not mine alone. Special thanks to my cousins Kendra, Andre, and C’sara for providing the blueprint.

To all my friends, colleagues, and mentors, thanks for your phone calls, texts, and private messages to check on how my dissertation was coming along. Special thanks to Dr. Sharrika D. Adams and Dr. V. Lynne Holland for challenging me to think critically about who I wanted to become as a scholar.

To my advisor and faculty chair, Dr. Claire K. Robbins, thanks for your leadership and tutelage throughout my entire doctoral process. Your suggestions regarding the research design for my dissertation could not have been any more spot-on. To the remainder of my faculty committee: Dr. Walter Lee, Dr. Glenda Scales, and Dr. Gabriel Serna, you were an amazing team of scholars. Thank you for sharing your expertise and always offering insights that helped me to refine my study.

To Dr. Bevlee Watford and my CEED family, thanks for all the opportunities you provided me with and for supporting my research interests. Words cannot express my gratitude.

To the participants who volunteered for my study, thanks for sharing your stories with me. Special thanks to Jasmine Brown, Portia Isaac, Tiara McDonald, and Amanda Welch. It was because of my interactions with you and the conversations we had that ultimately inspired me to explore my dissertation topic. Therefore, I dedicate this study to each of you.
# Table of Contents

Abstract ........................................................................................................................................... ii

General Audience Abstract ............................................................................................................... iii

Acknowledgements ......................................................................................................................... iv

Table of Contents ........................................................................................................................... v

List of Figures .................................................................................................................................... vii

Chapter One – Introduction ............................................................................................................. 1

  Statement of the Problem .............................................................................................................. 10

  Purpose of the Study ...................................................................................................................... 12

  Research Questions ....................................................................................................................... 12

  Significance of the Study .............................................................................................................. 13

  Delimitations ................................................................................................................................... 15

  Organization of the Study .............................................................................................................. 16

Chapter Two – Literature Review ................................................................................................... 17

  Research on Career Planning ...................................................................................................... 17

  Goal-Setting ................................................................................................................................... 19

  Possible Selves .............................................................................................................................. 22

  Research on Black Woman Engineering Majors ....................................................................... 25

  Influences on BWEMs’ Choices of Majors ............................................................................... 26

  Influences on BWEMs’ Choices of Careers .............................................................................. 30

  Summary of Argument .................................................................................................................. 32

Chapter Three – Methodology ....................................................................................................... 34

  Research Questions ....................................................................................................................... 34
Appendix D: Informed Consent Form.................................................................218
Appendix E: Projection Exercise.....................................................................222
Appendix F: Interview Protocol.......................................................................223
Appendix G: IRB Approvals...........................................................................225
Appendix H: Participant Check Email..............................................................228
List of Figures

Figure 1: Derived from Harrison’s (2008) Graphical Representation of Possible Selves.................23
Figure 2: List of Explication Terms, Definitions, and Labels.........................................................65
Figure 3: Category: Past Experiences with Emergent Themes and Sub-themes.....................66
Figure 4: Category: Developmental Contexts with Emergent Themes and Sub-themes..........86
Figure 5: Category: Social Contexts with Emergent Themes and Sub-themes .......................106
Figure 6: Category: First Iteration of Individualized Clusters with Emergent Themes and Sub-
themes.........................................................................................................................................124
Figure 7: Category: Second Iteration of Individualized Clusters with Emergent Themes and Sub-
themes ............................................................................................................................................138
Figure 8: Category: Third Iteration of Individualized Clusters with Emergent Themes and Sub-
themes ............................................................................................................................................146
Chapter One

Introduction

America needs an educated workforce, which translates to an increasingly high demand of employees with degrees in science, technology, engineering, and mathematics (STEM). STEM employees earn more than twice that of their non-STEM counterparts (National Science Board [NSB], 2015). However, the literature clearly indicates that due to their significant underrepresentation across all STEM professions, African Americans and women are largely excluded from receiving these types of financial advantages. Representation for members of both groups diminishes even further as they transition from the STEM classroom to the STEM industry, which is especially the case for engineering fields. My study explores what happens to individuals at the nexus of these two groups, those who identify as a Black woman engineering major (BWEM). It is essential that scholars address these labor force concerns by examining why this phenomenon occurs. Gaining a better understanding of how BWEMs set career goals would inform the work of educators, administrators, industry executives, and policymakers who seek to improve their representation in engineering professions.

Accordingly, the purpose of this phenomenological inquiry was to explore career goal-setting (CGS) processes among Black women in college who are majoring in engineering. In this chapter, I expand on the advantages of prospective STEM employees, the disadvantages of underrepresented populations in STEM, and the inequities experienced by Black women in engineering. I also introduce the concept of career goal-setting in relation to BWEMs. Additionally, the chapter includes statements about the research problem and research questions, as well as the study’s purpose, significance, delimitations, and an explanation of how the study is organized.
Need for an Educated Workforce

By 2022, approximately 65% of all new jobs in the United States will require a post-secondary degree or some type of workforce training (U.S. Bureau of Labor Statistics, 2013). The nation depends on higher education institutions to produce a highly skilled and more diverse pool of graduates. Currently, only 40% of U.S. working-aged adults have college degrees (McKiernan, 2012). Therefore, university governing boards and private agencies aim to increase the number of working-aged adults with high-quality degrees over the next several years.

According to the U.S. Bureau of Labor Statistics (2013), science and technology fields have been identified as the fastest growing occupational groups, with expectations that at least 1.7 million new jobs to be created within the next decade. Also, having been considered a major pathway to reduce unemployment and increase the nation’s global competitiveness, the Obama administration generously budgeted more than $3 billion towards STEM education with the aim of producing one million STEM graduates and hiring 100,000 additional math and science teachers before 2020 (National Science and Technology Council, 2013). Through this plan, the federal government was determined to stimulate the economy by promoting a highly skilled and technology-driven job market, appropriating almost half of its STEM education budget toward institutions of higher learning.

The government’s agenda for STEM in higher education includes enhancing curricula; increasing enrollment in science and technology disciplines, particularly as it relates to the recruitment of women and minorities; and sponsoring graduate fellowships for research through agencies such as the National Science Foundation (NSF), the National Institutes of Health, NASA, and the Department of Energy. Congress, along with the Trump administration, has also assisted in efforts to improve the career trajectories of underrepresented populations in
technology fields by legislating the Inspiring the Next Space Pioneers, Innovators, Researchers, and Explorers (INSPIRE) Women Act (H.R. 321, 2017) and the STEM Opportunities Act (H.R. 2528, 2019; S. 1270, 2017), both of which emphasize engineering occupations. The nation’s recently established initiatives pertaining to STEM education were designed to serve as an economic driver by producing graduates with attributes that meet the demands of an increasingly technologically-savvy labor market in the coming years (Casey, 2012; Feder, 2012). For instance, of the new professionals with high quality degrees, STEM graduates are more favorably regarded by employers. As a result, prospective employees who pursue science and technology careers are often characterized by several major advantages, which include a higher possibility for vacancies in their fields of employment, reduced unemployment rates, greater likelihood for job promotions, and substantial increases in salaries.

**Benefits of STEM Careers to Prospective Employees**

The first advantage that new STEM employees might benefit from includes a higher possibility for vacancies in their preferred occupational field. For the last several years, economists have forecasted an impending surge in new job openings to encompass a 17% increase in STEM positions by the start of 2020, almost twice that of non-STEM professions during the same period (Langdon, McKittrick, Beede, Khan, & Doms, 2011). The U.S. Bureau of Labor Statistics (2015) has projected that about one-fifth of the 7.9 million new jobs created in the U.S. by 2024 will be in areas related to the medical and applied sciences.

The second advantage STEM employees are likely to benefit from involves reduced unemployment rates. Employees in science and technology occupations rarely experience joblessness, even in times of economic recession (Langdon et al., 2011). However, if unemployment does take place, it often occurs at rates lower than the national average and or in
parity with professionals in comparable fields (Department for Professional Employees [DPE], 2014).

The third advantage STEM employees might benefit from includes a strong likelihood they will be promoted or advance into management positions. Equipped extensively with technical knowledge, many STEM graduates also bring an array of other talents with them to the workplace such as the ability to work in teams and communicate across areas of specialization to solve global challenges. As a result, even industry employers outside of the sciences have begun to see STEM workers as attractive hires (Adecco, 2016; Casey, 2012; NSB, 2015). These types of transferable skills allow them to move up the ranks into positions of leadership at a much quicker pace than their counterparts who completed degrees in other disciplines.

The fourth professional advantage for STEM employees includes having pursued careers where there are substantial increases in salaries. Based on the average median salaries of working adults, those employed in science and technology fields make more than twice as much as their non-STEM counterparts, earning roughly $34,000 more per year (NSB, 2015; NSF, 2015). Several STEM professions are listed as some of the highest paying out of all salaried positions. These occupations include petroleum engineering, nuclear engineering, aerospace engineering, computer science, and physics, each of which have earnings potentials of more than $100,000 annually (DPE, 2014; U.S. Bureau of Labor Statistics [BLS], 2013).

Underrepresented Populations in STEM

Unfortunately, all populations are not equally represented across STEM professions, nor do they share in the economic benefits provided to those employed in those fields. As a result, numerous corporations have acknowledged this chasm in both economics and industry and are diligently implementing efforts to increase the numbers of women and ethnic minorities
employed in STEM fields to better reflect the general population (Accreditation Board for Engineering and Technology [ABET], 2005; National Action Council on Minorities in Engineering [NACME], 2012; NSF, 2013).

African Americans are noticeably underrepresented across virtually every STEM discipline and employment field. They earn approximately 10% of bachelor’s degrees awarded in STEM and a little more than 5% of bachelor’s degrees awarded in engineering (NACME, 2012; NSB, 2014). Despite making up roughly 13% of the U.S. population, African Americans only represent about 8% of the STEM workforce and 4% of all engineering professionals (NSF, 2015; U.S. Census Bureau, 2012).

Women compose 50% of all graduates with bachelor’s degrees in science and technology disciplines; yet, they make up only 29% of the STEM workforce (NSF, 2017). Gender disparities are even more noticeable in engineering fields. According to the National Science Foundation (2013), the composition of women in engineering falls from 17% of those earning bachelor’s degrees to just over 12% of those who are employed in industry. Depending on the specific field of engineering, these types of disproportions can exacerbate even further. Mechanical and electrical engineering are two occupations where such paucities regarding women professionals are ongoing challenges (NSB, 2014; NSF, 2015).

Also, magnifying career-related issues for persons from minority backgrounds in STEM is the intersection of race and gender. Scholars refer to this nexus as the double bind or bicultural stress because these individuals belong to two groups that are both marginally represented in their profession, which creates additional challenges working in STEM (Combs, 2003; Obiomon, Tickles, Wowo, & Holland-Hunt, 2007). This is especially the case for women who identify as African American and are pursuing STEM careers.
Black women earn roughly 5% of bachelor’s degrees awarded in STEM disciplines, but only 1% of the bachelor’s degrees awarded in engineering (NSF, 2013). Unfortunately, their noticeably low representation is not limited only to STEM-related areas in academia, as their participation in industry is equally scarce. Black women who work in science and technology fields account for under 4% of the entire STEM labor force, with their numbers in engineering professions barely measuring up to 2% (Guerra, 2013; NSF, 2015).

**Economic Disparities for Black Women in Engineering**

Problems stemming from the paucity of Black women in engineering are not just limited to college enrollment and participation in industry. These inequities also impact the national economy, as this gap in the labor force leads to a gross misdistribution of employment benefits, especially those pertaining to salaried income. For instance, Black women make up 4.9% of all women and 25.2% of all African Americans who earn bachelor’s degrees in engineering (NSB, 2019). Yet, despite comprising somewhat larger portions within the degree-earning populations of their gender and racial groups, their representation in industry is still substantially lower than it should be. As a result, Black women are being excluded from potentially earning hundreds of millions of dollars each year in future wages.

Prior research strongly supports this claim, which can be illustrated in the following two points. First, Black women engineers would have access to approximately 30,000 more jobs if they were selected for engineering positions at rates identical to those at which they earn engineering degrees (NACME, 2012; NSF, 2010). Second, African Americans and women who receive STEM bachelor’s degrees and work in jobs related to their majors both make around $75,000 in salaries (Landivar, 2013). More specifically, Black engineers and women engineers also earn about the same amount annually, which is $40,000 more than the average median
salary for all U.S. employees (American Society of Civil Engineers and American Society of Mechanical Engineers [ASCE & ASME], 2012; Carnevale, Fasules, Porter, & Landis-Santos, 2016; BLS, 2015). Thus, these statistics lend tremendous plausibility to the argument that aspiring Black women engineers miss out on an estimated $1.2 billion in additional income each year.

Aside from these aforementioned claims, the longstanding push for the increased participation of Black women in engineering is not just an economic issue, but a moral concern as well. The very notion of addressing this problem is rooted in the principles of social justice theory, which suggests that industry employers are morally obligated to act in the best interests of society by attempting to correct systems that continuously disenfranchise women and ethnic minorities with regard to their social and economic mobility (Bankston, 2010; Mor Barak, 2005; Rawls, 1999). These sentiments could not be more apparent today, especially with the emergence of recent gender equality movements that seek to eradicate various forms of discrimination and abuse that affect women in the workplace (HeforShe, 2019; me too., 2018; TIME’S UP, 2020).

**Concerns for Black Woman Engineering Majors**

In helping to understand the enduring disparity of African American women in engineering more acutely, it is necessary to analyze this phenomenon at one of its earliest stages of development, namely, Black women’s college years. At the undergraduate level, African American women often encounter issues that hinder their academic progress in engineering disciplines, ultimately affecting their career aspirations. Some concerns for BWEMs include experiences of gender bias and discrimination, social isolation, and low academic expectations.
by faculty (Borum & Walker, 2012; Perna, Lundy-Wagner, Drezner, Gasman, Yoon, Bose, & Gary, 2009).

Complicating matters further, these issues mutually contribute to BWEMs’ lower self-efficacy in math and science. Self-efficacy is a term that describes an individual’s beliefs about his or her own ability to perform certain tasks (Bandura, 1986; Hackett & Betz, 1981). Scholars have developed several theories that focus on self-efficacy to help predict how college students make choices about careers, a process referred to as career decision-making (CDM). Applied broadly, CDM-related models describe the cognitive stages an individual navigates through when considering employment options (Peterson, Sampson, Lenz, & Reardon, 2002). At times, core concepts such as self-efficacy are also implemented to offer a distinct theoretical perspective and enhance the framework’s overall context. These specific approaches involving self-efficacy are commonly used for analyzing the CDM processes of two groups, specifically African Americans and women.

**Conceptualizing Career Goal-Setting among Black Woman Engineering Majors**

The literature shows that concerns related to self-efficacy for African Americans typically manifest in a phenomenon known as stereotype threat. This involves a situation that causes an individual to evaluate their performance when working on a specific task so as not to confirm a negative stereotype associated with the social group to which they belong (Steele & Aronson, 1995). These types of anxiety-provoking experiences are a major cause for the longstanding achievement gaps that exist between Black students and their White counterparts, especially in STEM disciplines (Spencer, Logel, & Davies, 2016). Furthermore, stereotype threat not only affects the way African Americans view their ability to be successful in applied science majors; it also influences their CDM processes related to STEM jobs.
Similarly, women’s self-efficacy is also shaped by others’ perceptions of how they should perform as members of a certain group. In this case, stereotypical judgments are assigned to gender, and questions are raised about their academic competence in math and science disciplines (Johnson, 2007; Steele, James, & Barnett, 2002). Essentially, both positive and negative persuasions that women receive from teachers and relatives in and away from classroom environments, the STEM-related skills and career aspirations of their women peers, as well as their own past experiences with STEM activities each play integral roles in helping them make decisions about pursuing careers in STEM fields (Perna et al., 2009).

As previously mentioned, self-efficacy is extremely pertinent to BWEMs’ CDM processes, because it influences which STEM majors they choose and what occupations they prefer most based on their skill level, knowledge of that field, and degree attainment (Gedye, Fender, & Chalkley, 2004; Perna et al., 2009). However, self-efficacy is only one perspective that scholars have theorized in attempts to explain how college students make choices about careers. Another concept that is used jointly with self-efficacy is career choice commitment. Career choice commitment consists of the actual steps implemented by an individual while they are searching for employment (Wang, LaRae, Haase, & Bruch, 2006). In other words, this theory describes how job seekers execute strategies that help them achieve their career goals (Peterson et al., 2002).

Career self-efficacy and career choice commitment concepts are essential for understanding the CDM processes implemented by college students. However, these models primarily address the more practical aspects of BWEMs’ career preferences as it relates to choosing an academic discipline or executing strategies that lead toward choosing a certain occupation. Another important component of CDM is CGS, which is a series of proactive
behaviors that occur during the career planning process and contribute to the development of an individual’s desired state of self in future work conditions (Strauss, Griffin, & Parker, 2012). Despite the significance of CGS to CDM, scholars have rarely examined CGS processes among BWEMs. Thus, the relationship between BWEMs’ CGS and their development of self while transitioning into the workforce is poorly understood.

One model that may help scholars understand this relationship is Markus and Nurius’s (1986) possible selves theory. The possible-self is an individual’s desired concept of self, which projects either who the individual should be or hopes to become (Higgins, 1998; Ibarra, 1999; Markus & Nurius, 1986). In addition, one’s idealized self is constructed based on past and present contexts in alignment with his or her future career goals (Markus & Ruvolo, 1989). Therefore, Lee and Osyerman’s (2009) possible selves model served as a guide for the study’s research questions; as it specifically focuses on a person’s past experiences, developmental contexts, and social contexts. Each of these factors was relevant for examining BWEMs’ CGS processes.

**Statement of the Problem**

By 2024, the U.S. labor force will require employees to earn high quality degrees (BLS, 2013; NSB, 2015), which encompasses STEM degrees (BLS, 2015; Langdon et al., 2011). Of the 20 million new jobs that will be created over the next several years (BLS, 2015; Carnevale, Smith, & Strohl, 2013; Giffi, Dollar, Drew, McNelly, Carrick, & Gangula, 2015), STEM careers are projected to grow at significantly higher rates than non-STEM professions (Adecco, 2016; BLS, 2013, Feder, 2012). Due to this escalating need for a technology-driven job market, STEM graduates will receive several career-related advantages, including a greater likelihood of job placement (BLS, 2015; U.S. Langdon et al., 2011), lower unemployment rates in their chosen
CAREER GOAL-SETTING OF BLACK WOMEN ENGINEERS

career fields (Casey, 2012; DPE, 2014), increased opportunities for upward mobility or advancement into managerial positions (Langdon et al., 2011; NSB, 2015), and higher salaries and wages compared to employees in other occupations (BLS, 2013; NSB, 2015; NSF, 2015).

There are inequities regarding those who receive benefits from earning STEM degrees (NACME, 2012; NSF, 2010). These disparities include African Americans in STEM (ABET; 2005; NSB, 2014) and engineering (NACME, 2012; NSF, 2013) and women in STEM (ABET, 2005; NSF, 2017) and engineering (NSF, 2013; NSF, 2015). Because they belong to both underrepresented groups, Black women in STEM and engineering are doubly disadvantaged (Combs, 2003; Guerra, 2013; NSF, 2013; Obiomon et al., 2007). Therefore, these disparities in engineering have caused Black women to be excluded from tens of thousands of potential jobs (NACME, 2012; NSF, 2010), equating to over $1 billion in missed wages (ASCE & ASME, 2012; BLS, 2015; Carnevale et al., 2016; Landivar, 2013). To provide a fuller context regarding the concerns of Black women in engineering (Borum & Walker, 2012; Chesler & Chesler, 2002; Johnson, 2007; Tsui, 2007), it is necessary to examine their experiences at the college level, which involves issues that affect their performance in STEM courses (Bandura, 1986; Hackett & Betz, 1981; Spencer et al., 2016) and ultimately how they make decisions about engineering careers (Gedye et al., 2004; Perna et al., 2009).

Several scholars have developed conceptual models that focus on self-efficacy for African Americans (Gloria & Hird, 1999; Steele & Aronson, 1995; Steele & Barnett, 2002) and women (Backer & Halualani, 2012; Hackett & Betz, 1981; Lease & Dahlbeck, 2009; Ong, Wright, Espinosa, Orfield, Bang, Hodari, Bath, & DeCarvalho, 2011) in relation to CDM. Further literature explores career self-efficacy in conjunction with career choice commitment (Chung, 2002; Richie, Fassinger, Linn, Johnson, Prosser, & Robinson, 1997; Wang et al., 2006;
Workman, 2015) and CGS (Markus & Ruvolo, 1989; Strauss et al., 2012). These frameworks are useful for understanding college students’ CDM processes, and include Black women. However, little is known about how BWEMs engage in CGS, which encompasses one’s development of an idealized career-self.

**Purpose of the Study**

This study explored the CGS process. A modified version of Markus and Nurius’s (1986) possible selves theory served as the conceptual framework. For the purposes of this study, I specifically focused on Lee and Oyserman’s (2009) three individual and contextual factors that influence possible selves: Past Experiences, Developmental Context, and Social Context.

I was particularly interested in the CGS processes of Black women in college who majored in engineering. All participants self-identified as Black/African American and as women; were not international students; anticipated graduating from college between the ages of 20 and 24; were enrolled in their final year of baccalaureate study in an engineering program; and were searching for employment in fields of engineering outside of academia at the time of the study. To explore the CGS processes of BWEMs thoroughly, I used a phenomenological, qualitative approach. I targeted an initial sample group of eight participants at a predominantly White institution (PWI) and planned to include additional participants if needed.

**Research Questions**

The concept of CGS is characterized by a series of self-guided and goal-specific behaviors, which often entails one’s construction of a desired self in alignment with his or her future goals. Possible selves theory is an explanatory component of CGS and exhibits several of the same attributes. Due to these conceptual similarities, a combined theoretical approach was
used to guide the main research question and subsequent questions for this study. The main research question was derived from Strauss, Griffin, and Parker’s (2012) model on future work selves, and the remaining sub-questions were based on Lee and Oyserman’s (2009) three individual and contextual factors of past experiences, developmental contexts, and social contexts:

**RQ:** What is the lived experience of constructing an idealized career-self as part of the CGS process among BWEMs?

**SQ1:** How have past experiences of success and failure related to engineering influenced the way BWEMs set future career goals?

**SQ2:** How do developmental contexts (i.e. current academic, occupational, and interpersonal experiences) influence the way BWEMs set future career goals?

**SQ3:** How do social contexts, including the racial and gender disparities in engineering, influence the way BWEMs set future career goals?

**Significance of the Study**

This study was significant for several constituents. One group that might benefit from the findings includes academic administrators in colleges of engineering. The findings of this study provided administrators with detailed information about BWEMs’ career goal-setting processes. They might use the findings to mentor and advise BWEMs regarding career issues.

Another group that might benefit from the findings includes recruiters from engineering companies. The findings of this study provided industry recruiters with data surrounding which contextual factors are most important to BWEMs when setting career goals. They might use the findings to highlight workplace conditions that attract BWEMs to their respective companies.
One more group that might benefit from the findings includes Black women majoring in engineering. The findings of this study provided BWEMs with information about how individuals of the same race, gender, and educational background also set career goals. They might use the findings to help modify their current values and priorities in order to align them with their future career goals.

The present study also had significance for future research. This study explored career goals set by BWEMs prior to completing their degree. A future study might consider the career goal-setting processes of African American women who have already earned an engineering degree and are currently employed in the profession. Such a study would expand on the information available about career goal-setting among Black women engineers.

Again, my research topic focused on BWEMs as a sample group. Other studies might investigate the career goal-setting processes of women engineering majors who identify as Latinx, Native American, Pacific Islander, or multiracial. Such studies would illuminate the influences of racialized ethnic differences on career goal-setting processes among students who are underrepresented in engineering.

As stated previously, the sample group in this study involved Black women majoring in engineering. Another study might explore African American women in the final year of degree completion in other applied science disciplines. Such a study would expand on the goal-setting processes Black women undergo when pursuing a spectrum of White- and male-dominated professions.

Finally, this study was significant for institutional policy makers. The findings of this study provided career services directors with information about how BWEMs prioritize their current skills when setting goals for their future careers. Directors might use these findings to
improve policies that provide access to information about experiential learning and employment opportunities in specific majors for all groups of students.

The findings of this study provided National Association of Colleges and Employers (NACE) stakeholders with information regarding the contextual factors BWEMs consider when setting career goals. Stakeholders might use these findings to enhance employment selection procedures that may adversely influence students due to their race and gender.

The findings of this study provided the National Action Council for Minorities in Engineering (NACME) board of directors with information about how BWEMs set career goals. The NACME board consists of industry executives from more than 35 companies. Board members might use these findings to evaluate employment policies in each of their own corporations.

The findings of this study also provided state educational governing boards with information regarding contextual factors BWEMs consider when setting career goals. Board members might use these findings to enhance policies related to K-12 education and higher education that promote engineering careers as employment options for Black women.

**Delimitations**

As with any research project, this study had several initial delimitations. The first related to the sample. It is possible that the number of participants in the study did not represent all perspectives that BWEMs might consider when setting career goals. The sample was composed entirely of volunteers, and those volunteers’ responses may have differed from the responses of non-volunteers. Therefore, the voluntary nature of the respondents should be considered when interpreting the findings.
The next delimitation also related to sample. It is possible that the participants in the sample may have exhibited some apprehensions toward the researcher. The sample was comprised entirely of women, and those women’s responses in an interview conducted by a man-identified researcher may have been less candid than if the interview had been conducted by a woman-identified researcher. As a result, the possibility of the researcher’s positionality or the participants’ aversion toward the researcher might have altered the findings.

Another delimitation related to the interview protocol. Based on the questions I chose to ask during the interviews, participants may have either misinterpreted them or failed to provide meaningful responses to those questions. It is possible that the richness of participants’ responses may be influenced by their comprehension of the interview questions. For that reason, the types of questions included in the interview protocol might have altered the findings.

**Organization of the Study**

The present study is organized around six chapters. Chapter One introduces the topic and broader issues surrounding the topic, the purpose statement, the central research question, and the significance of the study. Chapter Two provides a literature review relevant to the study. Chapter Three describes the methodology of the study, including how the sample was selected and the procedures I used to collect and analyze data. In Chapters Four and Five, the findings of the study are reported. The findings are discussed in Chapter Six, along with implications for future practice, research, and policy.
Chapter Two

Literature Review

To explore the research on the career goal-setting process, I first examined research on career planning processes among college students. Two subsets of studies emerged in this review: those that investigated how college students develop goals, and those that explored how college students construct possible selves. Given the focus of the study, I also examined research on Black women engineering majors (BWEMs). In reviewing this literature, two areas of focus emerged: influences on BWEMs’ choices of majors, and influences on BWEMs’ choices of careers. This chapter is organized around these two major bodies of literature and their respective subcategories.

Research on Career Planning

Much of the literature surrounding career planning is related to the CDM processes of college students. This body of work examines college students’ personal backgrounds in relation to how they make career-oriented decisions (Astin, 1984; Bandura, 1986; Hackett & Betz, 1981; Super, 1980). For the purposes of this study, I define personal backgrounds as aspects of an individual’s lived experiences that provide context for the way they plan for future employment. Throughout the literature, these types of contextual influences are represented in three forms: parental support, racial identity, and value systems.

Several scholars have researched the effects of parental support on college students’ CDM (Kenny, 1990; Lease & Dahlbeck, 2009; Workman, 2015). This part of the literature helps explain how parental behaviors and career trajectories influence the way students pursue career interests. These studies focus on the career development of ethnic minorities (Fisher & Padmawidjaja, 1999; Fouad, 1995; Hernandez, 1995; McCollum, 1998; Ogbu, 1988) and women
(Pearson & Bieschke, 2001; Richie et al., 1997) as they pertain to student-parent relationships. The literature also shows how parental support varies according to students’ choice of academic major (Hoffman, St. Louis, & Hoffman, 2010; Scott & Mallinckrodt, 2005).

Furthermore, there is research on college students’ racial identity in relation to CDM. This part of the literature focuses on racial identity development concurrently with career development (Cheatham, 1990; Gloria & Hird, 1999; Hernandez, 1995; McCowan & Alston, 1998; Osipow & Fitzgerald, 1996; Parham & Austin, 1994), as well as information about same-race career role-models (Chesler & Chesler, 2002; McCollum, 1998; Tsui, 2007). In addition to these, other studies involve middle and high school students, ranging from a variety of ethnic groups (Dillard & Campbell, 1981; Garriott, Flores, Prabhakar, Mazzotta, Liskov, & Shapiro, 2014; Lee, 1984; Turner, Steward, & Lapan 2004).

Lastly, scholars have also researched college students’ value systems in relation to CDM (Blustein, 2011; Peterson et al., 2002; Super, 1957). This part of the literature explains how culture-specific contexts shape an individual’s career ambitions. These studies focus on the relationships that students’ personalities (Holland, 1997; Roe, 1956, 1957), their attachments to societal causes (Johnson, 2005; National Association of Colleges and Employers, 2015; Parham & Austin, 1994), and the career expectations of their relatives and community members (Harper, 2012; Hughes & Gibbons, 2016; Leong, 1991; McCollum, 1998; Whiston & Keller, 2004) have in determining what types of occupations they choose.

Not only does the literature address how college students make decisions about careers and what factors influence their CDM, but there is also research on the various steps they implement while pursuing their career interests. This part of students’ career planning process becomes more personalized as it involves their formation of a future self in accordance with
developing work-related goals (Strauss et al., 2012). This phenomenon is called career goal-setting, which is better explained by first examining the body of work concerning the general concept of goal-setting.

**Goal-Setting**

The first subset of literature that relates to college students’ career planning process focuses on goal-setting theory. Edwin Locke (1968) established goal-setting as a conceptual framework to describe the exact steps individuals take when developing goals. This process is characterized by several primary actions which consist of selecting a desired goal, formulating and implementing strategies necessary for achieving that goal, tracking one’s progress toward completing the goal, and soliciting feedback as a method of evaluating goal-related activities (Locke, 1996). In addition to these steps, self-efficacy plays a vital role in the goal-setting process, because it significantly affects goal choice and the development of plans related to achieving a goal (Latham & Locke, 1991; Locke, 1991).

Scholars suggest that self-efficacy serves as the underlying or motivating force behind one’s need to establish and attain goals (Backer & Halualani, 2012; Bandura & Locke, 2003; Markus & Ruvolo, 1989). The literature widely supports these claims through studies that examine the effects of self-efficacy on academic goal-setting (Pajares, 1996; Pajares, 2002; Schunk, 1990; Zimmerman, Bandura, & Martinez-Pons, 1992) and career goal-setting (Abele & Spurk, 2009; Blustein, 1989; Brown & Matusovich, 2016). Self-efficacy serves as an integral and recurring component of goal-setting frames as well as social cognitive frames, both of which intersect to form what is referred to as cognitive goal theory (Bandura, 1986; Blumenfeld, 1992; Dweck, 1986). Of these types of frames, the concept of self-regulation is often used as a model for understanding how goals are developed and implemented.
Self-regulation

Self-regulation is a cognitive process that involves the way individuals manage or control themselves for the purposes of accomplishing goals (Bandura, 1991; Latham & Locke, 1991; Locke & Latham, 2002). These efforts are categorized based on the aspects of one’s thoughts, feelings, and actions when planning and pursuing goals (Zimmerman, 2000). Due to this systematic arrangement of efforts in three categories, self-regulation provides a structural representation for describing the goal-setting process. Each categorical aspect connects almost seamlessly with the respective stages of Locke’s initial framework and is also influenced by self-efficacy, either directly or indirectly.

The first aspect of self-regulation involves an individual’s thoughts, which encompasses how one conceptualizes goals and the activities necessary for achieving those goals (Bandura & Locke, 2003; Locke, 1991). These efforts are referred to as goal attributes, which are defined by the goal’s specifics and level of difficulty, as well as the amount of concentration that goes into planning for the goal (Latham & Locke, 1991; Locke, Shaw, Saari, & Latham, 1981). Additional efforts called goal commitments involve an individual’s desire to reach goal attainment despite encountering challenges or impediments during the course (Locke & Latham, 1990). These thought processes replicate the goal selection and planning strategies according to Locke’s frame. They are also directly influenced by self-efficacy, as the thought aspect of self-regulation is based on an individual’s volition to set a goal and their belief that the goal can be successfully achieved (Binswanger, 1991; Koch & Nafzinger, 2011; Latham & Locke, 1991; Schunk, 2001).

The second aspect of self-regulation involves an individual’s feelings, which are pervasive throughout the entire goal-setting process and become salient in the goal selection and
evaluation stages. Feelings are mostly associated with the concept of self-efficacy, due to the emphasis it places on perceptions or an individual’s beliefs about his or her ability to successfully accomplish a goal (Bandura, 1986; Bandura & Locke, 2003). This relationship between confidence and goal achievement directly influences what types of goals individuals actually set (Blustein, 1989; Latham & Locke, 1991; Pajares, 1996; Schunk, 2001) and their decision to self-regulate or modify behaviors necessary for achieving a desired goal (Bandura & Locke, 2003; Binswanger, 1991; Koch & Nafzinger, 2011; Locke & Latham, 2002; Pajares, 2002). On the other hand, self-efficacy indirectly influences one’s level of satisfaction with goal achievement. The literature suggests that individuals typically set goals with already established expectations about how those goals should be successfully attained (Abele & Spurk, 2009; Bandura, 1991; Ivancevich, 1976; Latham & Locke, 1991; Locke, 1991; Locke et al., 1981).

The third aspect of self-regulation involves an individual’s actions or the strategies and activities one implements while in pursuit of a goal (Latham & Locke, 1991). Similar to the thought aspect, actions are also categorized as goal commitment efforts. However, the actions aspect is composed of the behavioral rather than the mental contributions an individual makes toward goal achievement. Accounts of self-regulatory actions are best represented in the literature as studies that focus on goal-setting in relation to self-efficacy and performance (Latham & Locke, 1991; Locke, 1991, 1996) and goal-setting in relation to feedback (Kopelman, 1986; Locke & Latham, 2002; Locke & Latham, 1990). Thus, scholars also confirm the notion that self-efficacy directly influences the actions aspect of self-regulation.

In brief, much of the research on goal-setting focuses on examining goal-directed behaviors, which includes the broader concept of self-regulation. Scholars have enhanced this body of work by expanding on what is known about the relationships that exist between an
individual’s performance and their ability to set goals on his or her own (Koch & Nafzinger, 2011; Schunk, 1990, Schunk, 2001), as well as how individuals use feedback to motivate, challenge, and guide themselves in setting additional goals (Bandura, 1989; Bandura & Cervone, 1983, 1986; Bandura & Locke, 2003; Becker, 1978). Several of these frames are related to career goal-setting and maintain the use of self-regulation as a theoretical underpinning (Backer & Hulualani, 2012; Kerpelman, Shoffner, & Ross-Griffin, 2002). For instance, one such model incorporates the concepts of self-regulation, identity construction, and mental simulation to describe how an individual develops an idealized work self as a future goal (Strauss et al., 2012).

These types of frames derive from possible selves theory, which also help to explain college students’ career goal-setting processes.

**Possible Selves**

The second subset of literature that relates to college students’ career planning process focuses on possible selves theory. This framework explains how an individual constructs an idealized or desired self (Markus & Nurius, 1986). The possible-self acts as an incentive for future behavior by allowing an individual to make sense of past experiences, which provides context for evaluating his or her current view of self. Possible selves theory is also characterized by an arrangement of self-schemas (i.e. past self, the present self, and the future self) that represent individuals’ valanced expectations of who they are, who they want to be, and who they should avoid becoming (Cross & Markus, 1991; Markus & Nurius, 1986). Conceptual models using this frame typically encompass four main perspectives: temporality, contextual influences, identity formation, and self-regulation.

The first perspective focuses on phases of time and acknowledges that the possible selves frame operates entirely from a temporal viewpoint (Markus & Nurius, 1986). Therefore, an
individual’s cumulative experiences over different time spans essentially guide how they make meaning of self-schemas (Peetz & Wilson, 2014; Pizzolato, 2006; Pronin, Olivola, & Kennedy, 2008; Waid & Frazier, 2003). The second perspective emphasizes the significance of social and developmental contexts and the need for balance between these two contexts (Kao, 2000; Oyserman & Fryberg, 2006; Vignoles, Manzi, Regalia, Jemmolo, & Scabini, 2008). This means that an idealized self is influenced by an individual’s system of values, which is largely shaped by his or her socio-cultural background and station in life. The third perspective focuses on one’s formation of identity and how an individual conceptualizes his or her current self in relation to possible self-schemas. Representations of self are imagined as “expected,” “hoped-for,” or “feared,” and are categorized in the literature as conceptual schema (Vignoles, Regalia, Manzi, Golledge, & Scabini, 2006; Yowell, 2002). These schema are best illustrated in Figure 1. The fourth perspective involves the process of self-regulation or how one modifies his or her behaviors to create an idealized self, which are categorized in the literature as procedural schema (Carver & Scheier, 1982; Dembo & Crocker, 2009; Kerpelman, Shoffner, & Ross-Griffin, 2002; Robinson, Davis, & Meara, 2003).

![Diagram](image-url)

**Figure 1.** Derived from Harrison’s (2018) graphical representation of possible selves.
The possible selves frame is also recognized as a version of cognitive goal theory due to its emphasis on self-initiated change, which elicits actions to be directed toward the goal of identity construction (Lee & Oyserman, 2009; Markus & Nurius, 1986; Strauss et al., 2012). In contrast, possible selves theory also features several qualities that distinguish it from more traditional goal-setting theories. For instance, one distinctive trait is that possible selves theory studies achievement from more of a conceptual point of view (Markus & Nurius, 1986; Strauss et al., 2012) rather than focusing on goal commitment efforts by examining activities (Latham & Locke, 1991). Thus, the frame provides space for individuals to explore career possibilities through mental projection and imagining what success or failure might look like prior to implementing goal-related strategies.

Another trait is that possible selves theory places emphasis on past experiences and value systems. With traditional goal-setting theories, values are only implicitly mentioned when describing initial motives, and past experiences are narrowly used to explain the relationship that self-efficacy has with goal choice (Locke, 1991). Consequently, any further references of those experiences or values throughout the remainder of the goal-setting process are noticeably absent. However, possible selves models expressly feature historical, developmental, and social contexts as salient motivational properties throughout the entire transformation process (Lee & Oyserman, 2009; Ruvolo & Markus, 1992; Oyserman & Fryberg, 2006; Wurf & Markus, 1991).

Lastly, the trait of temporality is probably what makes possible selves theory the most unique. As mentioned, temporal self-schemas are the crux of possible selves theories, which rely on the use of time spans much more extensively than do other goal-setting frames (Pizzolato, 2006; Yowell, 2002). This trait essentially guides the identity formation process and acts as a blueprint for planning future endeavors (Markus & Ruvolo, 1989). Therefore, not only do these
qualities separate possible selves theory from other goal-setting theories, they also establish it as an appropriate framework for exploring career goal-setting processes. It is also important to note that self-schemas (i.e. feared, hoped-for, and desired selves) associated with possible selves theory are predominantly mentioned in the literature in the future tense (Cross & Markus, 1991; Strauss et al., 2012). However, for the purposes of this study, I also chose to include the present or expected self, which encompasses self-schema in the short-term future as well.

In short, possible selves theory collectively merges various theoretical perspectives to form career goal-setting as a unified product. To embody this concept most efficiently, a combined approach was used to provide an epistemological framework for the study. Strauss, Griffin, and Parker’s (2012) perspectives of self-regulation, identity construction, and mental simulation were used to guide the main research question. In addition, Lee and Oyserman’s (2009) three individual and contextual factors of past experiences, developmental contexts, and social contexts helped to develop the subsequent research questions. Each of these subcategories was relevant to the overall topic. However, I also needed to explore the existing literature related to Black women majoring in engineering disciplines, the sample for the study.

**Research on Black Woman Engineering Majors**

Initially, research about BWEMs addresses career development theory in association with African American college students (Evans & Herr, 1994; McCollum, 1998; Naidoo, Bowman, & Gerstein, 1998). The literature then narrows sequentially to include studies about Black students who are pursuing STEM degrees (Espinosa, 2008; Grandy, 1998; Gwilliam & Betz, 2001; Russell & Atwater, 2005); Black women who are pursuing STEM degrees (Borum & Walker, 2012; Hanson, 2004; Green & Glasson, 2009; Jackson, 2013; Nave, Frizell, Obiomon, Cui, & Perkins, 2006; Ong et al., 2011; Perna et al., 2009; Russell & Russell, 2015; Whitten, Foster,
Duncombe, 2003); and more specifically, Black women who are pursuing degrees in engineering (Brown, 1997; Lent, Brown, Sheu, Schmidt, Brenner, Gloster, Wilkins, Schmidt, & Lyons, 2005; Tate & Linn, 2005; Trenor, Yu, Waight, Zerda, & Sha, 2008). Scholars have explored the various conditions that influence BWEMs’ decisions to pursue engineering as a profession, which is typically categorized into two groups: studies that examine BWEMs’ choices of majors and studies that examine BWEMs’ choices of careers. Collectively, these subcategories help elucidate Black women’s experiences in engineering, particularly by describing their lives from both personal and professional contexts. Each set of contextual conditions is relevant to the sample, as they help provide the foundation for analyzing BWEMs’ worldview as aspiring engineers.

The first set of conditions that affect BWEMs’ career decisions involves their personal contexts of race and gender (Cheatham, 1990; Johnson, 2007; Osipow & Fitzgerald, 1996; Parham & Austin, 1994; Perna et al., 2009). These contexts often merge to create dual disadvantages for them in academic and work settings (Obiomon et al., 2007; Ong et al., 2011; Tang, 1997; Vining-Brown, 1994). In addition to challenges they face due to their race and gender, BWEMs encounter a second set of conditions that shape their career trajectory as well. These conditions combine to form professional contexts, which influence their involvement in career-related activities, opportunities, and interactions with others (Dillard & Campbell, 1982; Smith, 1983; Sue & Sue, 1990). To further expound on BWEMs’ experiences overall, it is first necessary to explore the body of work surrounding how they actually choose engineering as an academic major.

**Influences on BWEMs’ Choices of Majors**
Extant literature regarding BWEMs’ choice of major comprises studies that focus on their experiences while enrolled in college. Because engineering is but one of several STEM disciplines, and particularly a field in which African American women are disproportionately underrepresented, most of the research about this population encompasses their participation in STEM as undergraduate students (Borum & Walker, 2012; Dillard & Campbell, 1982; Liou-Mark, Dreyfuss, Blake, Lansiquot, & Yu, 2013; Naidoo, Bowman, & Gerstein, 1998; Perna et al., 2009). This body of work mainly expounds on the contextual conditions that negatively influence Black women’s pursuit of engineering degrees. The information provided from these studies is often categorized according to BWEMs’ experiences before and during college.

Part of the literature on BWEMs’ negative experiences addresses several barriers that hinder their academic success prior to arriving in college. First, Black women often take less challenging math and science courses in high school, which inadequately prepares them for the academic rigors associated with engineering programs at the post-secondary level (Green & Glasson, 2009; Jackson, 2013; Lent et al., 2005). Second, many of them receive little career advisement about engineering before college, giving them limited knowledge about the different types of engineering majors or opportunities for advancing in those fields (Downing, Crosby, & Blake-Beard, 2005; Russell & Russell, 2015). Third, Black women also suffer from a lack of career trajectory related to engineering due to a paucity of professional role models of their same race and gender (Ong et al., 2011; Tang, 1997). Lastly, BWEMs are rarely supported by their families when choosing engineering majors (Carlone & Johnson, 2007; Chowdury & Chowdury, 2007; Trenor et al., 2008).

In addition to their pre-college issues, BWEMs experience difficulties while enrolled in college that impair their success in engineering. Initially, Black women are often the targets of
racial and gender bias in engineering classrooms, particularly at predominantly White institutions (PWIs) (Borum & Walker, 2012; Frillman, Brawner, & Waters, 2010; Marra, Rodgers, Shen, & Bogue, 2009; Ong et al., 2011). BWEMs are also likely to endure negative stereotypes, feel socially isolated, and lack the support of faculty and peers who sometimes perceive them as intellectually inferior (Espinosa, 2008; Johnson, 2007; Russell & Russell, 2015; Tate & Linn, 2005). Other conditions that negatively affect Black women’s in-college experiences include environments that encourage individual competition, weeding out processes, and a male-dominated socialization of engineering (Crawford & MacLeod, 1990; Frizell & Nave, 2008; Green & Glasson, 2009; Jackson, 2013). Institutional cultures like these contribute to an unwelcoming or “chilly” climate for BWEMs, which sometimes causes them to switch out of engineering majors (Chesler & Chesler, 2002; Litzler, Samuelson, & Lorah, 2014; Seymour & Hewitt, 1997; Tsui, 2007).

Despite the notoriety of BWEMs’ negative experiences, there is also research on contextual conditions that promote the advancement of Black women in science and engineering disciplines (Lent et al., 2005; Nave et al., 2006; Perna, Gasman, Gary, Lundy-Wagner, & Drezner, 2010). This body of work includes studies that examine practices and policies aimed at enhancing institutional climates for BWEMs. For instance, positive environmental conditions that help eliminate barriers for Black women in engineering consist of academic departments with emphases on inclusive teaching and learning techniques (Jackson, 2013; Perna et al., 2009), encouragement from faculty (Perna et al., 2010; Johnson, 2007; Zeldin & Pajares, 2000), peer support and cooperative group interactions (Espinosa, 2008; Grandy, 1998; Ong, 2005; Tate & Linn, 2005), active learning and undergraduate research opportunities (Borum & Walker, 2012; Maton & Hrabowski, 2004; Perna et al., 2010), as well as connections with professional mentors.
and role models (Chesler & Chesler, 2002; Downing et al., 2005; Johnson, 2007; Ong et al., 2011). Additional motivating factors include providing BWEMs with opportunities that enable them to help others and align their career interests in engineering with societal causes (Grandy, 1998; Johnson, 2005).

Much of the literature about the positive environmental conditions for BWEMs examines strategies geared toward improving student success for African American women in STEM, primarily those attending HBCUs and single-gender colleges (Borum & Walker, 2012; Frillman, Bronner, & Waters, 2010; Frizzell & Nave, 2008; Jackson, 2013; Lent et al., 2005; Marra et al., 2009; Perna et al., 2010). Science and engineering programs at these institutions are often characterized by small class sizes, highly accessible and interactive faculty members, social and academic support resources, and extensive alumni networks (Johnson, 2007; Perna et al., 2009). Contrary to the competitive nature of PWIs, same-race/gender colleges implement collaborative techniques and provide structure for environments that support BWEMs. Therefore, Black women are encouraged to invest in personal relationships, maintain sisterly bonds, and work together interdependently for collective attainment (Lent et al., 2005; Perna et al., 2010).

Furthering the notion that supportive communities have a positive impact on BWEMs’ college experiences, Marra and colleagues (2005) suggest that Black women’s feelings of inclusion are greater contributors to their success in STEM disciplines than competence or self-efficacy. Therefore, BWEMs are more likely to thrive at HBCUs and institutions where they have personal attachments to other students and instructors in their academic department (Spencer, Logel, & Davies, 2016; Walton & Cohen, 2007; Walton, Logel, Peach, Spencer, Zanna, 2014). These environmental conditions are just a few factors that help improve the academic climate for Black women in STEM. Nevertheless, BWEMs’ college experiences not
only influence which majors they choose; these experiences also impact their decisions about whether to continue to pursue occupational interests in engineering.

**Influences on BWEMs’ Choices of Careers**

The literature regarding BWEMs’ choice of careers expounds on their post-graduation experiences as underrepresented women who are either exploring career opportunities or working in multiple STEM fields. This body of work includes studies about the negative contextual conditions that affect Black women’s decisions to pursue employment as scientists and engineers. Principally, Black women are doubly marginalized due to their intersecting identities as both African Americans and women (Ong et al., 2011; Tang, 1997; Tyson & Borman, 2010), causing them to feel socially isolated, devalued, or unfit as STEM professionals (Armstrong & Jovanovic, 2015; Mack, Johnson, Woodson, Henkin, & Dee, 2010; Trower, 2008). In addition, Black women in these occupations often encounter negative stereotypes and racial bias (Jackson, 2004; Ross, Capobianco, & Godwin, 2017; Turner, 2002), questions about their competence or intellectual ability (Brawner, Camacho, Lord, Long, & Ohland, 2012; Kvasny, Trauth, & Morgan, 2009; Williams, Phillips, & Hall, 2016), and a lack of support from supervisors and colleagues (Mack et al., 2010; Ross & Godwin, 2015; Tyson & Borman, 2010).

Many of the professional challenges that hinder Black women in STEM closely resemble what they experience as undergraduates. However, some problems do not emerge until after they become employed. An example of this is illustrated in Black woman engineers’ (BWEs) struggle to maintain a sense of career-life balance. Scholars have developed several theoretical frames that explore the ways BWEs navigate workplace demands while also managing daily responsibilities in their personal lives (Buse, Bilimoria, & Perelli, 2013; Fouad, Fitzpatrick, & Liu, 2011; Kachchaf, Ko, Hodari, & Ong, 2015; Reed & Tull, 2015; Ross & Godwin, 2015).
Their efforts to preserve career-life balance typically consist of three main challenges: being required to over-perform or repeatedly prove their credibility as engineers, having to choose between fulfilling maternal obligations and conflicting career expectations, and being tokenized or designated as the “chosen” woman at their respective work sites (Fabert, Cabay, Rivers, Smith, & Bernstein, 2011; Hurtado & Figueroa, 2013; Kvasny, Trauth, & Morgan, 2009; Obiomon et al., 2007; Williams, Phillips, & Hall, 2016).

Additionally, the literature concerning BWEs is typically organized in two parts. One body of work explores the perspectives of BWEs working in academia, and another body of work explores the perspectives of BWEs working in industry. Studies that focus on Black women in academic fields of engineering examine the contextual conditions that influence their experiences as graduate students preparing for professorship (Brawner et al., 2012; Chesler & Chesler, 2002; MacLachlan, 2006; Ong et al., 2011; Tsui, 2007; Tyson & Borman, 2010) and as faculty members in pursuit of tenure (DeCuir-Gunby, Grant, & Gregory, 2013; Hurtado & Figueroa, 2013; Jackson, 2004; Mack et al., 2010; Quinn & Spreitzer, 1997; Turner, Gonzalez, & Wong, 2011; Williams, Phillips, & Hall, 2016). Also, studies that focus on Black women in industrial fields of engineering explore their experiences in work environments that either perpetuate social and economic disparities (Bell, 1990; Ong, 2005; Ross & Godwin, 2015; Shenhav, 1992; Tang, 1997) or promote structures of empowerment (Buse, Bilimoria, & Perelli, 2013; Kvasny, Trauth, & Morgan, 2009; Ross, Capobianco, & Godwin, 2017; Turner, 2002) for BWEs.

In summary, there is extensive research on the career planning processes of African Americans (Cheatham, 1990; Gloria & Hird, 1999; Osipow & Fitzgerald, 1996; Parham & Austin, 1994) and women (Lease & Dahlbeck, 2009; Pearson & Bieschke, 2001; Ritchie et al.,
CAREER GOAL-SETTING OF BLACK WOMEN ENGINEERS

1997) in college. There is also research about goal-setting in general (Bandura, 1986, 1991; Bandura & Locke, 2003; Latham & Locke, 1991; Locke, 1991) and career goal-setting, more specifically known as personalized career planning (Markus & Nurius, 1986; Ruvolo & Markus, 1992; Oyserman & Fryberg, 2006; Strauss et al., 2012). Furthermore, there are studies about how Black women choose engineering majors (Borum & Walker, 2012; Lent et al., 2005; Ong et al., 2011; Perna et al., 2009; Tate & Linn, 2005), how they choose engineering careers in academia (Armstrong & Jovanovic, 2015; Chesler & Chesler, 2002; Mack et al., 2010; Tyson & Borman, 2010) and how they choose engineering careers in industry (Buse, Bilimoria, & Perelli, 2013; Fouad & Fitzpatrick, 2011; Kvasny, Trauth, & Morgan, 2009; Ross, Capobianco, & Godwin, 2017).

Summary of Argument

A review of the literature revealed several gaps in prior research regarding BWEMs’ choices of majors and careers. First, the research on Black women in engineering professions mostly focuses on their experiences in academia, either as graduate students or as faculty members. On the contrary, there are few studies about BWEMs’ post graduate experiences in non-academic fields, particularly those transitioning into the workforce for the first time. Second, the body of work surrounding Black women in industrial fields of engineering often includes studies that fail to disaggregate BWEs by race or ethnicity, and instead, lumps them together with all women or all underrepresented women as one monolithic sample group (Buse, Bilimoria, & Perelli, 2013; Fabert et al., 2011; Hurtado & Figueroa, 2013). Third, the possible selves framework has been used previously to examine the career planning processes of Black women in high school and college (Kerpelman, Shoffner, & Ross-Griffin, 2002; Oyserman, Grant, & Ager; 1995; Packard & Nguyen, 2003; Pizzolato, 2006), undergraduate engineering
students (Papafilippou & Bentley, 2016; Carrico, Boynton, Matusovich, & Paretti, 2013), and professionals in academia (Strauss et al., 2012; Wilson, 2017). However, extant literature provides few illustrations of how BWEMs engage in personalized career planning that results in the development of their idealized career self. My study contributed to the literature by illuminating the career goal-setting processes of BWEMs in non-academic engineering settings.
Chapter Three

Methodology

This study explored the CGS process. A modified version of Markus and Nurius’s (1986) possible selves theory served as the conceptual framework. For the purposes of this study, I specifically focused on Lee and Oyserman’s (2009) three individual and contextual factors that influence possible selves: Past Experiences, Developmental Context, and Social Context.

I was particularly interested in the CGS processes of Black women in college who majored in engineering. All participants self-identified as Black/African American and as women; were not international students; anticipated graduating from college between the ages of 20 and 24; were enrolled in their final year of baccalaureate study in an engineering program; and were searching for employment in fields of engineering outside of academia at the time of the study. To explore the CGS processes of BWEMs thoroughly, I used a phenomenological qualitative approach. I targeted an initial sample group of eight participants at a PWI and planned to include additional participants if needed.

Research Questions

The concept of CGS is characterized by a series of self-guided and goal-specific behaviors, which often entails one’s construction of a desired self in alignment with their future goals. Possible selves theory is an explanatory component of CGS and exhibits several of the same attributes. Due to these conceptual similarities, a combined theoretical approach was used to guide the main research question and subsequent questions for this study. The main research question was derived from Strauss, Griffin, and Parker’s (2012) model on future work selves;
and the remaining sub-questions were based on Lee and Oyserman’s (2009) three individual and contextual factors of past experiences, developmental contexts, and social contexts:

RQ: What is the lived experience of constructing an idealized career-self as part of the CGS process among BWEMs?

SQ1: How have past experiences of success and failure related to engineering influenced the way BWEMs set future career goals?

SQ2: How do developmental contexts (i.e. current academic, occupational, and interpersonal experiences) influence the way BWEMs set future career goals?

SQ3: How do social contexts, including the racial and gender disparities in engineering, influence the way BWEMs set future career goals?

In this chapter, I describe the methodological design of the study. The chapter also includes an explanation of the researcher’s worldview and positionality, sample selection process, data collection strategies, data collection procedures, data analysis procedures, and steps taken to achieve authenticity and trustworthiness.

**Phenomenology**

Qualitative methods are generally implemented when studying the in-depth perspectives of individuals and the processes they undergo when encountering certain conditions (Creswell, 2009). More specifically, a phenomenological approach is necessary for gaining insight about one’s lived experiences or how an individual establishes a worldview (Holloway, 1997; Kruger, 1988; Kvale, 1996; van Manen, 1990). Many of the same techniques used in phenomenological studies are also practiced across the wider landscape of qualitative research (Creswell, 2009). However, several procedures are specific only to phenomenological frames, particularly those relating to the collection and analysis of data (Creswell, 2013; Hycner, 1999). For instance,
when formulating strategies for phenomenological inquiry, researchers often base their methodological design on one of three paradigms: transcendental phenomenology, existential phenomenology, or hermeneutic phenomenology (Crotty, 1998). I chose the hermeneutic frame to guide this study’s methods because it mainly focuses on the essence of the phenomenon and how individuals make meaning of the conditions they encounter (Jones, Torres, & Arminio, 2014). Along with the research design, the actual methods themselves and the manner in which they are applied collectively distinguish phenomenological methodologies apart from other qualitative approaches.

Again, the characteristics that make phenomenological research unique are most noticeable throughout the implementation of data collection and data analysis procedures. The first technique involves the required number of participants in the sample. Traditionally, 15 to 20 participants are interviewed for many qualitative studies, but sample sizes for phenomenological studies may include as few as five or six participants (Creswell, 1998; Morse, 1994). This type of methodological approach mainly focuses on who is involved in the study and what their perspectives are regarding an issue, which means that the sample is chosen purposively or participants are only selected if their experiences are directly connected to a specific phenomenon (Kruger, 1988; Schwandt, 1997). Therefore, phenomenological researchers typically try to interview no more than 10 participants when seeking saturation, which is achieved when participants exhaust the interview topics and new participants no longer express different points of view (Charmaz, 2006; Groenwald, 2004; Morse 2000).

The next distinguishing technique is exemplified in the data collection process. For example, data is gathered over the course of several interviews rather than a single interview, as is standard practice for many other qualitative methodologies (Jones et al., 2014). Researchers
often use Seidman’s (1989) three in-depth interview approach, which includes asking participants to reflect on their past experiences in the first interview, provide details about their present experiences in the second interview, and elaborate on their entire experience in the third interview (Marshall & Rossman, 2011; Seidman, 2006). This incremental style of interviewing is designed to elicit responses from participants that articulate the essence of how they perceived the phenomenon. This approach helps provide authentic descriptions of participants’ experiences as they experienced them, and enable findings to emerge throughout the forthcoming stages of analysis (Bentz & Shapiro, 1998).

Another characteristic of phenomenological research is a multi-step process called explication, which consists of bracketing, intuiting, analyzing, and describing (Swanson-Kauffman & Schonwald, 1988). Bracketing is one of the first techniques researchers use when beginning a study, which helps them abstain from relying on their own preconceptions as a primary resource for interpreting data (Moustakas, 1994). Instead, they encourage participants to make meaning of the phenomenon by reflecting on their experiences with it and providing insight about how they valued the occurrence (Kruger, 1988; Kvale, 1996). The next step in the explication process involves intuiting or gathering vivid descriptions of the phenomenon as it naturally occurs (Bentz & Shapiro, 1998; Creswell, 2009). As interviews are conducted, researchers often compile detailed field notes or memos and have participants express their thoughts and emotions through essays or reflective journals (Groenwald, 2004). It is important to note that bracketing and intuiting are usually initiated during the data collection phase, but they continue in a constant back-and-forth way until data analysis has been completed (Jones et al., 2014).
Analyzing is perhaps the most complex stage of the explication process, as it consists of scrutinizing and categorizing data into themes that closely reflect the essence of the phenomenon (Hycner, 1999). Researchers extract the participants’ most significant comments or “units of meaning” (UOM) from each of the interviews and place them into a separate list (Moustakas, 1994). Those UOM are then grouped together by topic to form themes or “units of significance” (UOS), which are also scrutinized to ensure that each theme depicts the essence of phenomenon (Creswell, 1998; Groenwald, 2004). Describing is the last step in the explication process that takes place when researchers provide a composite summary of the most significant statements from each of the three interviews with participants (Hycner, 1999; Moustakas, 1994). These descriptions include extractions from the themes or topics that best typify what participants experienced and how those experiences occurred (Creswell, 2013).

It is also important to note that, like other qualitative approaches, phenomenological research is inherently interpretivistic (Creswell, 2009). This means that researchers develop a general understanding of how they think participants experienced a phenomenon and then try to convey those experiences based on their own perceptions of what occurred. As a result, the interpretivist paradigm helps to inform the study in a couple of ways. For instance, the researcher serves as a vital source of data during the collection phase through their interactions with participants, which also guides the analysis process by providing the researcher with insight about how to induce themes and categories from the initial data (Creswell, 2009; Jones, Torres, & Arminio, 2006).

On the contrary, methodologies that involve interpretivist forms of inquiry can at times be problematic. Because their methods rely heavily on the researcher for gathering data, most qualitative approaches require them to acknowledge their past experiences and personal
backgrounds in a statement of positionality prior to the analysis phase to reduce any biases regarding how they interpret the data (Creswell, 2009). However, several scholars posit that qualitative researchers can never be separated from the data they collect, nor can their research ever be completely neutral (Denzin & Lincoln, 1994). In other words, how a researcher understands participants’ experiences influences the way they report the study’s findings, which sometimes makes it difficult to ascertain whose interpretations they actually represent (Creswell, 2009). Taking all of this into consideration, phenomenological researchers are challenged with exploring how their participants “experience the world” without prescribing abstract categories or classifying the data, in addition to ensuring that the findings reflect the essence of those experiences in relation to the phenomenon as closely as possible (Hycner, 1999; Moustakas, 1994; van Manen, 1990).

**Worldview and Positionality**

As previously stated, qualitative research methodologies call for the researcher to acknowledge any biases they have that may contribute to the study. To some extent, all qualitative methodologies require the researcher to interpret the experiences of others when presenting the data to readers (Creswell, 2009). However, phenomenological studies require the researcher to bracket out or withhold their prior knowledge or suppositions about the targeted phenomenon rather than assume an interpretive role (Moustakas, 1994). Therefore, it was necessary for me to explain my position as a researcher by assessing my own personal background and past experiences in relation to the study. I provide this positionality statement to help readers gain a better understanding of the research topic, sample of participants, and the setting in which the phenomenon occurred.
For almost a decade, I served as a college administrator working with first-year transition and retention programs, specifically those that assisted students from underrepresented populations. For four years, I also served as a staff member in an academic support unit that promotes the advancement of women and ethnic minorities in engineering disciplines. One of my responsibilities included mentoring African American students who sought career advice and/or professional guidance, several of whom were BWEMs. These women often confided in me about their paraprofessional experiences as aspiring engineers, divulging the types of issues they encountered while working at internships and attending career fairs.

As part of their recollection process, the BWEMs also described how they had become aware of potential employers who might foster less inclusive work environments, which entailed failing to offer family-friendly policies, both officially or unofficially, and providing few examples of women and ethnic minorities who had advanced to leadership positions within those organizations. The women added that these conditions ultimately affected which companies they wanted to work for or saw themselves working for. Therefore, I formulated the research topic based on multiple conversations I had with these students, which also aligns with my career interests of improving conditions for underrepresented students who are interested in pursuing STEM occupations.

Despite my expertise in assisting BWEMs previously, I had a limited perspective about what participants in the sample truly experienced as engineering undergraduates. My gender identity and contextual background as a man who earned a bachelor of fine arts degree also differed from their worldviews as woman engineering majors. Nevertheless, I did have something in common with participants by identifying as an African American. My previous role as a mentor for BWEMs also gave me the credibility necessary for encouraging participants
to discuss their experiences with me. In Chapter Four, I provide a detailed description of my preconceptions about how BWEMs engage in CGS.

In designing the study, my focus was on understanding the experiences of BWEMs as they construct idealized career-selves as part of their CGS processes. The literature implies that relevant frameworks like possible selves can be applied to individuals who are seeking employment in a variety of work settings, which include both academia and industry. Given the lack of scholarship pertaining to BWEMs’ career aspirations in industry, I was interested in discovering how their past experiences and present social and developmental contexts help them develop healthy self-images that contribute to their career success. The use of phenomenological methods was most appropriate for exploring the CGS processes of BWEMs because participants were positioned to experience the phenomenon as it occurred in its natural setting. This approach also elicited detailed descriptions of how participants were thinking and feeling while partaking in their respective CGS processes, as well as allowing them to define their own experiences in their own words (Bentz & Shapiro, 1998).

Sample Selection

Qualitative inquiry requires researchers to collect samples purposively in order to identify individuals or sites that will contribute to a better understanding of the research problem (Creswell, 2009). Therefore, I chose individuals at one specific site that were most able to provide data that answered the study’s central research question and three related sub-questions. To collect data, I engaged in two types of sampling. First, I selected an institutional sample. Second, I selected individual participants from that institution.

The first sample selection process involved identifying an institution with a high potential of having a rich pool of potential participants for the study. I used two main criteria for selecting
this type of institution. First, I selected a university that was nationally recognized for producing high numbers of engineering graduates and for demonstrating a commitment toward assisting in the advancement of women and minorities in engineering disciplines (American Society of Engineering Education [ASEE], 2016; NACME, 2016; Roy, 2018). This criterion ensured that the selected college or university was more likely to enroll a critical mass of individuals who identified as African American and were majoring in engineering or a discipline closely related to engineering (i.e., computer science, material science, construction management). Second, I needed to be certain that the institution actively recognized a collegiate chapter of the National Society of Black Engineers (NSBE) in addition to having a minority engineering programs (MEP) office on their campus. This criterion was necessary for refining potential participants’ majors specifically to engineering and for identifying Black women in those disciplines, as collegiate NSBE chapters and MEP offices are indicators for engineering programs with strong African American enrollments and havens for significant BWEM involvement (ASEE, 2016; NSBE, 2017a; NSBE 2017b).

Next, I confirmed that this particular institution had both a NSBE chapter and an MEP office according to their respective websites. Then, I contacted a staff member with the MEP office at the university to ensure that its chapter was active before I gave the site full consideration. The MEP staff member acted as a gatekeeper at this stage of sample selection (Creswell, 2009) due to their willingness to provide me with vital information about the status of that NSBE collegiate chapter and a large enough population of Black women in the chapter’s membership. Once the institution’s NSBE chapter was confirmed as active, I finalized the institutional sample and proceeded to the second level of the sample selection process, which involved recruiting individual participants.
For the individual sample, I aimed to select eight participants. As I selected participants, I made sure that they met seven criteria. First, participants had to identify racially and ethnically as Black/African American. The second criterion was that participants also needed to identify as women. These two criteria were important because I wanted to study individuals who shared life experiences due to being situated at a specific intersection of race, ethnicity, and gender. The third criterion was that the participants had to be majoring in engineering. This criterion ensured that I would include only individuals with potential career interests in engineering. The fourth criterion was that participants were not international students. This criterion was important because I wanted to increase the likelihood that participant’s past and present experiences were shaped by the same types of contextual influences (Lee & Oyserman, 2009), which helped to establish common senses of meaning across their expressions.

The fifth criterion was that they had to be enrolled in their final year of a baccalaureate program, and the sixth criterion required participants to be between the ages of 20-24. These two criteria were intended to eliminate potential participants who were not simultaneously preparing to graduate from college and searching for a job. The seventh criterion was that they had to be actively seeking employment in a field of engineering outside of academia. This included students enrolled in engineering programs in addition to those employed in co-op programs at the time of the study. However, the criterion excluded potential participants who were considering engineering careers in higher education.

I specifically wanted to recruit participants at least six months prior to their graduation from college so that I could evaluate their career goal-setting processes while they were searching for employment. Throughout the fall semester, I corresponded with the MEP staff member to solicit eligible participants for my sample group. Even though I chose the fall to
recruit participants, I wanted to avoid times when participants might be away from campus for major career fairs or when classes were not in session. Therefore, I emailed the MEP staff member again who provided me with access to potential participants as well as advice regarding when the most optimal dates and times would be to meet with them. I requested the staff member’s permission to distribute a call for research participants (Appendix A) through the NSBE chapter’s general membership email listserv and Facebook site, as well as the MEP office’s weekly announcements to minority engineering students.

I created one design for the recruitment announcement in multiple formats (i.e., Word, pdf, and email text) so that it could be distributed using a variety of electronic media. The announcement included a general statement regarding the purpose of the study, description of participant criteria, detailed information about the interview process (i.e., complete two 60 to 90-minute interviews, review summaries of the interviews), and an indication that volunteers would receive a $15 gift card in appreciation of their participation at the end of the second interview. The recruitment announcement also included my email address so that potential participants could contact me directly in a confidential manner. Potential participants were instructed to complete a pre-screening questionnaire (Appendix B) in addition to contacting me via email to arrange a screening phone call if they were interested in participating in the study. After receiving the pre-screening questionnaires, I only called those potential participants who met all the necessary selection criteria.

During the phone call, I conducted a pre-screening interview to confirm each of the potential participants’ eligibility. By building rapport during this phone call, I was able to evaluate whether or not I believed they would be able to provide robust answers to the interview questions, thus informing the central research question and sub-questions. The pre-screening
questionnaire also inquired about the participants’ demographic information, which included age, gender, race, ethnicity, major, enrollment classification, anticipated graduation date, national origin, and socioeconomic status. The pre-screening process allowed me to ask about what types of employment were included in their search process to ensure that participants were considering careers in fields of engineering outside of academia. I conducted the pre-screening process until I had recruited the appropriate number of participants for my sample.

In addition to the pre-screening process, I took the following steps in preparation for the participant interviews. Prior to the pre-screening phone calls, I asked the MEP staff member to help reserve meeting rooms at the institution for conducting interviews over the two- to three-day periods I would be visiting their campus. The locations were private, reasonably accessible to participants, and in places where participants felt comfortable to share their experiences. I had the meeting rooms reserved during times, usually late afternoons on weekdays, when participants were most likely available to speak with me about their CGS processes as BWEMs. I also made sure that none of the meeting rooms were located near the gatekeeper’s office, and I kept the names of the individuals who chose to participate in the study confidential from the gatekeeper as well.

At the close of each pre-screening phone call, I thanked the prospective participant for their time and told them that I would contact them shortly to inform them if they were selected for the study or not. Then, I chose the prospective participants with the greatest likelihood for providing robust answers to the interview questions to be included in the sample. After they indicated via email that were willing to take part in the study, I called them to let them know they had been selected and scheduled the first interview. After the phone call with the selected participants, I emailed a confirmation to them with the date, time, and location of the interview.
I also attached an informed consent form (Appendix D) and a projection exercise (Appendix E) about possible selves to the confirmation email, both with instructions for the participant to review prior to the interview. I sent a reminder via email to participants three days prior to their scheduled interview and another one 24 hours before the interview.

All prospective participants met the selection process and proceeded to take part in the interviews. However, if they had not or were not selected after the pre-screening process, I would have sent them an email (Appendix C) informing them that they would not be included in the study. I also thanked them for their time and willingness to participate. I closed the email by wishing them luck in their senior year and with their job search.

Although I followed these procedures exhaustively to recruit eight participants, only five prospective participants who met all of the criteria volunteered for the study. Nevertheless, the sample size was sufficient for conducting a valid phenomenological study, as I was still able to capture a significant amount of the participants’ viewpoints that directly related to CGS during the data collection process (Creswell, 1998; Morse, 1994).

The sample was composed of five undergraduate students all of whom identified as Black/African American, as women, and were enrolled in an engineering program during their senior year of college at a public, research-intensive university in the southeast. The average age of the sample was 21 years (range = 21-22 years). None of the participants were international students; however, two of them self-identified ethnically as belonging to African subgroups. Academic majors varied across engineering disciplines (3-materials science and engineering, 1-industrial and systems engineering, and 1-civil engineering), and two students were also minoring in biomedical engineering. Despite four of the participants having provided some
information about their parents’ educational backgrounds and/or occupations, none of their parents had majored in engineering nor were any of them employed as engineers.

**Data Collection Strategies**

Two strategies were implemented for data collection in this study: a projection exercise and an interview protocol. The first strategy involved a projection exercise that was emailed to participants prior to their initial interview. The exercise featured a brief paragraph that helped introduce the concept of possible selves to participants:

Probably everyone thinks about the future to some extent. When doing so, we usually think about the kinds of experiences that are in store for us and the kinds of people we might possibly become. Sometimes we think about what we will probably be like, other times about the ways we are afraid we might turn out to be, and at other times what we hope or wish we would be like. One way of thinking about this is to talk about possible selves. We can probably imagine a number of possible selves in terms of the kind of people we might become, the way we might feel, or the actions we might take. Some of these possible selves are similar to the way we are now or almost surely will be, and some may be only vague thoughts or dreams about the future. (Markus, 1987)

I asked each participant to review this paragraph and come prepared to give a description of their possible selves and discuss their thoughts about their future career goals during the first interview.

The second strategy was guided by an interview protocol that included 15 questions. This semi-structured protocol was designed to elicit data that could be used to answer the research questions posed in the study. Lee and Oyserman’s (2009) individual and contextual factors; Strauss, Griffin and Parker’s (2012) theoretical perspectives; and Seidman’s (2006) multiple-interview approach each assisted in guiding the interview questions. Again, the study relied on a purposive sample, which posed as a challenge when attempting to recruit a sample size of as many as eight participants. Therefore, I condensed Seidman’s interview technique
from a three-step process to a two-step process as a means of attracting more volunteers and to maximize their availability to participate with the interviews.

A complete copy of the interview protocol is included in Appendix E. The protocol was composed of two parts (i.e. interview #1 and interview #2), each of which included five sections.

**First Interview**

The first section of the interview #1 protocol contained two items and focused on establishing rapport with participants to put them at ease. I asked participants how their week had been so far. I also asked participants to tell me about some of the projects they were currently working on, or what they might be looking forward to that week.

The second section of the interview #1 protocol focused on the participants’ past experiences related to social contexts and contained two items. For example, I asked each participant to tell me about her life before college, going back as far as possible. This question elicited data about the participants’ life histories to serve as contextual foundations for their experiences. I also asked participants how their experiences with family members, friends, teachers, and people in their communities had shaped their career goals. This question was asked to generate data regarding social and cultural influences on the participants’ CGS processes.

The third section of the interview #1 protocol focused on the participants’ past experiences related to developmental contexts and contained one item. I asked participants how they became an engineering major. This question elicited data about what events, circumstances, and other motivational factors influenced participants to select engineering as a major.

The fourth section of the interview #1 protocol focused on the concept of possible selves and contained one item. I asked participants who they expected to become in the next five years.
This question elicited data about how participants might begin to construct a new concept of self in the process of setting career goals.

The fifth section of the interview #1 protocol focused on the closing of the interview and contained one item. I asked participants if they wanted to share anything further about their experiences related to CGS. This question was asked to elicit data about participants’ thoughts and feelings that were not expressed in response to the previous interview questions.

I closed the first interview by thanking the participants for their time. I also scheduled a date and time seven days later to meet with them again for a second interview.

**Second Interview**

The first section of the interview #2 protocol focused on establishing rapport with participants to put them at ease and contained one item. I asked participants how everything had been since we had last spoken and to elaborate about those happenings.

The second section of the interview #2 protocol focused on the participants’ present experiences related to developmental contexts and contained two items. I asked participants to envision themselves one to five years into the future and to describe what their future careers would be like. This elicited data about participants’ career aspirations and how they perceived their lives might be as professionals in the near or immediate future. I also asked participants what they were currently doing or planning to reach their career goals. This question was asked to provide detailed information about their present CGS experiences.

The third section of the interview #2 protocol focused on the participants’ present experiences related to social contexts and contained one item. I asked participants how relatives, friends, faculty, administrators, and professional mentors helped them reach their career goals.
This question was asked to provide detailed information about various social influences on participants’ CGS.

The fourth section of the interview #2 protocol focused on each participant’s overall experience and contained three items. These questions included the reflective aspects of Seidman’s (2006) approach, which I incorporated at the end of the second interview rather than in a third interview. I asked participants how they understood CGS and what it meant to them. This elicited data about how participants made sense of the CGS process. Next, I asked them what mattered most about their CGS experience overall. This question was asked to provide further information about participants’ meaning making. I also asked participants to tell me about which possible selves they thought would be true for them in the next five years. This elicited data about who participants hoped to become, who they wanted to avoid becoming, and who they expected to become in the upcoming years.

The fifth section of the interview #2 protocol focused on the closing of the interview and contained one item. Once again, I asked participants if they wanted to share anything further about their experiences related to CGS to elicit data about their thoughts or feelings that were not expressed in response to the previous interview questions. In closing the second interviews, I communicated with each participant that I would be sending them a composite summary of our conversation for them to review. Finally, I thanked the participants for their time and concluded the interview.

I mostly conducted the first and second interviews with each participant at least one week apart. This gave them time to reflect on their respective experiences related to CGS in addition to thinking through how they would form idealized future career selves. However, due to one participants’ lack of availability, she chose to be interviewed twice on the same day. Although
that was not my initial intention, I proceeded in taking Seidman’s position that “it is almost always better to conduct an interview under less ideal conditions than not to conduct one at all” (2006, p. 21).

To enhance the quality of my study prior to the data collection process, I had a draft of the interview protocol reviewed by a panel of individuals with expertise in CGS and qualitative research methods. I then piloted the interview protocol with a small group of BWEMs who met all the selection criteria to be eligible to participate in the study but were not enrolled at the institution included in the sample selection. The pilot group offered feedback regarding the clarity of the questions and the order in which they should be asked. I revised the protocol based on feedback from both the panel of experts and the pilot participants.

**Data Collection Process**

Prior to the data collection process, I obtained approval from the Institutional Review Board (IRB) at my home institution, in addition to approval from the IRB at the university where I planned to conduct interviews, if needed. Copies of the IRB approval(s) are included in Appendix G.

I contacted the MEP staff member to help reserve locations for the interviews. Each interview was located at a private meeting place that was reasonably accessible to participants and a place where they felt comfortable to share their experiences. I also reserved meeting rooms during times suggested by the MEP staff member, usually late afternoons on weekdays, when participants were most likely available to speak with me about their CGS processes as BWEMs. Due to ongoing challenges regarding the participants’ time availability and lack of access to confidential spaces, all of the second interviews were conducted using a web-based videoconferencing platform with their approval. One participant’s time was so limited that she
chose to be interviewed in two consecutive sessions rather than a week apart. Both of her interview sessions were conducted via web conference. The videoconferencing technique was actually more beneficial to the interview process because it allowed participants to have complete autonomy over selecting confidential spaces where they felt most comfortable. In addition, it provided me with an opportunity to video-record the interviews as a means of capturing the participants’ audible comments along with their visual and/or non-verbal forms of communication as well.

After pre-screening potential participants to ensure that they met the sample criteria, I emailed each of them an informed consent form along with the date, time, and location of their interview. In addition to the consent form, I emailed participants a projection exercise about possible selves and instructed them to review the document for further discussion at their first interview. Three days prior to each interview, I sent an email reminder to the participant and another follow-up reminder 24 hours before the interview.

On the day of the first interview, I tested the audio and/or videoconference recording devices to ensure that they worked appropriately and printed out copies of the informed consent form for participants to sign. When participants arrived at the first interview, I made attempts to put them at ease by asking them about their day and other informal questions to help establish rapport. I also briefly shared with participants my positionality as a researcher for conducting the study, and I had them review and sign the informed consent form. Next, I asked participants for their pseudonym and explained how the pseudonym would help to protect their confidentiality in audio recordings and transcripts. I then turned on the digital and/or videoconference recorder and asked participants for their permission to record the interview.
Once they agreed, I summarized that I had received their informed consent form and that we
would both use their preferred pseudonym during the remainder of the interview.

The interview protocol was semi-structured and was entirely composed of open-ended
questions. This allowed for some standardization in asking questions, but gave participants the
opportunity to respond freely as they shared experiences related to their CGS processes. Both
interviews lasted approximately 60 minutes in length.

In concluding the first interview, I made sure to thank the participants for their time and
willingness to share their experiences related to their CGS processes, and I scheduled a time and
location to meet with them for the second interview. All second interviews were scheduled
approximately seven days from the initial interviews. For the second interview, I followed the
same procedures taken prior to and during the first interview. However, before concluding the
second interview, I communicated with participants that I would be sending them composite
summaries of their interviews for them to review.

After visiting my institutional sample site and completing all first and second interviews,
I had the digital audio and videoconference recordings of every interview transcribed by an
online transcription service, Rev.com. In regard to the videoconference recordings, the audio
files were extracted and uploaded for transcription; the video files were not shared with the
transcription service. During the subsequent data analysis process, I made composite summaries
of each interview and sent copies of them via email (Appendix H) to the respective participants.
I asked participants to review their interview summaries, make any corrections or clarifications
they felt were necessary, and return those responses back to me within a week.

Data Analysis Process
Data analysis was driven by the central research question and sub-questions as well as the past experiences, developmental context, and social context factors of Lee and Oyserman’s (2009) possible selves model. I also began analyzing data all throughout the collection stage using a combined explication approach (Hycner, 1999; Swanson-Kauffman & Schonwald, 1988). This process consisted of several steps such as bracketing, intuiting, delineating units of meaning, clustering units of meaning to form themes, and describing (Groenwald, 2004).

**Bracketing**

The first explication step I implemented was bracketing, which helped preserve the quality of the data. Prior to the interview phase, I purposefully isolated or bracketed out everything I previously knew about the phenomenon. By making notes and setting aside this information to use as a reference later throughout the analysis process, I attempted to refrain from making any preconceived notions about participants’ experiences prior to collecting data in the interviews (Miller & Crabtree, 1992; Moustakas, 1994). My bracketed prior knowledge and experiences are listed in the subsequent section.

**Prior Knowledge and Experiences**

First, I needed to ensure that my study would explain the phenomenon specifically from the participants' worldviews and not my own. Therefore, I used a reflexive technique called *epoche'* before collecting any data, which helped me to acknowledge my various preconceptions about how BWEMs engaged in their CGS processes (Moustakas, 1994).

*Epoche'. I compiled a list of notes regarding my prior knowledge and experiences related to the phenomenon, which was gained entirely through my role as a support staff member in an MEP office. I have provided details of those experiences and possible presumptions below:
1. Almost all of the BWEMs that I mentored were assertive in pursuing and completing internships. It was not uncommon for them to intern for the same company more than once, which may have even been extended into the fall semester as a co-op. I also learned that just because BWEMs participated in a series of internships with a particular company did not ensure that they would pursue permanent employment with the same organization. Several of the Black women I mentored prior to my study mentioned that they looked for internship opportunities solely to help them gain professional experience as engineers, despite their having little interest of ever being employed with the intern site and regardless of their having interned there multiple times.

2. Having served as a liaison between the MEP office and several corporate partners in engineering, I was aware that they primarily recruit prospective employees over the course of two cycles throughout the year. The first recruitment cycle falls between the months of September and October with the second cycle falling between March and April. However, I learned through past conversations with engineering students that the first wave of recruitment is perhaps the most significant of the two and involves a series of job fairs that primarily attracts seniors who are seeking employment after May graduation. Therefore, I assumed that BWEMs were quite familiar with how these cycles work, and used the spring career fairs as preliminary trials in preparation for the fall career fairs.

3. In my role as an academic coach, I sometimes encountered BWEMs who struggled to find their fit within engineering, even as juniors and seniors. Additionally, BWEMs seemed to gravitate toward engineering disciplines that are associated with causes that
they connect to personally, which aligned with literature on Blacks who pursue degrees in STEM. This typically included majors like biomedical engineering, biological systems engineering, or industrial and systems engineering, occupations that help people somehow perhaps by improving their quality of life or preventing occupational hazards.

4. Several BWEMs shared with me that the financial benefits of becoming a professional engineer was something they looked forward to upon completing their degree. Another incentive for them involved the notion that engineers work in cities all over the U.S. or travel regularly as part of their jobs. For instance, many of my colleagues and former students who identified as BWEMs either had interned or are now working in locations such as Houston, TX; Los Angeles, CA; Hampton, VA; Charleston, SC; Baton Rouge, LA; New York, NY; and the Northern Virginia-Washington, D.C. area. Some of them had even ventured abroad to parts of the Caribbean, Africa, and Asia to collaborate on engineering projects as well.

5. It was also my assumption that organizational culture might play a significant role in BWEMs' CGS processes, as some of my mentees talked about researching companies that exhibited work environments that best suited their anticipated lifestyles. After job interviews or conversations with career fair representatives, BWEMs would often share with me in confidence that they were attracted to employers who they knew would provide them with a supportive community and encourage them to advance within the company. Also, despite their eagerness to enter the workforce, these women were very concerned with whether or not they would be able to fulfill various aspects of their personal lives while simultaneously establishing themselves as professional engineers.
6. Lastly, my expertise was only limited to discussion items that I knew to be factual, which I used as a means of connecting with participants during the interviews. This included topics such as academic requirements for engineering majors, minority engineering support programs and activities, corporate recruitment cycles, and engineering career fair schedules, as well as BWEMs' actions, statements, or accomplishments that I had observed in the past. On the contrary, I refrained from making any speculations about an individual's particular reasoning for pursuing a major, occupation, or professional opportunity related to engineering.

Next, I set aside the aforementioned list of notes for later reference as an attempt to bracket out my prior knowledge and beliefs about the phenomenon. By doing this, I was able to dissect the participants' CGS processes and explain the phenomenon strictly from their vantage points with little to no interference from my own suppositions. (Miller & Crabtree, 1992; Patton, 2002).

**Intuiting**

The next step of the explication process involved intuiting, a technique I implemented during the interview phase. After each interview, I compiled a series of field notes about what I saw and heard from participants as they spoke or what I thought when reflecting on their CGS processes to ensure that I stayed immersed in the study rather than relying on my own interpretations (Bentz & Shapiro, 1998; Miles & Huberman, 1984). For instance, I used my observational notes to monitor the participants' thoughts and feelings as they shared their respective experiences (Jones et al., 2014). I also kept memos to help me distinguish between
what they experienced exactly as the participants expressed themselves and how I may have interpreted their experiences (Groenwald, 2004).

Furthermore, whenever a participant mentioned an activity, event, or condition about which I may have had prior knowledge, I made every attempt to limit my assumptions by either asking them a follow-up question or prompting them to clarify their statement. Then, in my field notes, I tried to summarize the participants’ experiences using their own words and phrases as much as possible. Next, I compared those notes to my epoche’ list in effort to prevent my positionality from influencing the study’s findings. After conducting the interviews, I had each of the recordings transcribed. Once the transcriptions were completed, I assigned each transcript a name based on the pseudonym of the participant that was interviewed. For example, transcripts for the first three participants I interviewed were referred to as Wesley, Jennifer, and Renee. I read over each transcript at least twice to deepen my understanding of each interview before engaging in further analysis (Creswell, 2003).

Delineating Units of Meaning

For the next step of the analysis stage, I delineated UOM by identifying comments that best typified what the participant experienced while engaging in CGS (Moustakas, 1994). I then combined the UOM from both interviews of all five participants and compiled them into one super list. Next, I separated the UOM into four parts in accordance with the research sub-questions and another subset of questions related to possible selves. As previously mentioned in Chapter Three, the research sub-questions were based on Lee and Oyserman’s (2009) individual and contextual factors of past experiences, developmental contexts, and social contexts. Therefore, I created a sub-list of UOM for each of these three factors, as well as creating a fourth sub-list for the participants’ comments about their respective possible selves.
Clustering Units of Meaning into Themes

After examining the list of the UOM, I began clustering or grouping them together into separate smaller lists. Next, I compared those significant phrases with the recorded interviews to develop an “essence of the clusters,” which directly reflected participants’ experiences related to CGS (Hycner, 1999). Once this was completed, I formed a series of themes based on the meanings associated with those clusters and labeled them according to relevant topics from the interview protocol (Creswell, 1998; Moustakas, 1994). For example, I asked participants how their experiences with specific people in their lives had shaped their career goals, and what they were currently doing or planning to reach their career goals, and if they would like to offer a few words of advice to other BWEMs who may follow in their footsteps. Thus, these UOM were clustered together and identified as three separate themes: Specific People, which related to participants’ past experiences or the first research sub-question; Specific Steps, which related to participants’ developmental contexts or the second research sub-question; and Advice to Other BWEMs, which related to social contexts or the third research sub-question. Once I had created all possible clusters and identified all associated themes, I concluded the clustering process and developed a preliminary list of all of the themes in the data.

Describing

For the last explication step, I created composite summaries of the two interviews completed with each participant, which best described how they experienced the phenomenon of CGS as illustrated by the themes generated through the data analysis process (Bentz & Shapiro, 1998; Creswell, 2013). First, I examined the list of themes and clusters in search of any common or unique themes that emerged and summarized the interviews for each participant based on those themes (Hycner, 1999; Moustakas, 1994). I also made sure that each summary featured the
most salient UOM from relevant clusters to reflect accurately what participants expressed in the interviews. Then, I returned the composite descriptions to those respective participants for validation (Hycner, 1999). Summarizing the interviews helped to advance the trustworthiness of the study and enabled me to conclude data analysis (Creswell, 2009).

Together, the list of themes and clusters and the composite summaries allowed me to develop a narrative that included direct quotations from each participant to illustrate how that participant experienced each theme. Once the explication process was completed and themes were established, I was able to answer the central research question and sub-questions. I organized the findings from my study into a composite description that helped clarify how individual and contextual factors influence the way BWEMs construct idealized career selves as part of their CGS processes.

**Authenticity and Trustworthiness**

The authenticity of a qualitative study is measured by how relevant the data collected in the study are to the research questions (Creswell, 2003). I sought to enhance authenticity using three methods. First, I purposively selected the site and participants in order to select individuals with the greatest likelihood of sharing experiences that would inform the research questions (Creswell, 2009; Hycner, 1999; Kruger, 1988). Second, I had an expert panel review a draft of my interview protocol. These individuals examined the protocol to ensure that the questions asked were relevant to the research sub-questions and aligned with my conceptual framework (Creswell, 2003). Lastly, I piloted the interview protocol with a small sample of BWEMs who met the selection criteria for the participant sample but were not enrolled at the institution in the study. This technique enabled me to revise parts of the interview protocol that were unclear or
did not lead to responses that address the research sub-questions (Seidman, 2006). Each of these steps enhanced the authenticity of data collected in my study.

Another criterion for advancing the accuracy, credibility, and confirmability of a qualitative study’s findings is referred to as trustworthiness (Creswell, 2009). I chose several methods to establish trustworthiness. One of these techniques involved triangulation, or the steps researchers take to confirm their findings by implementing more than two data sources or other analysis methods (Holloway, 1997; Knafl & Breitmayer, 1991). I used a modified version of Seidman’s (2006) in-depth three-interview approach as a primary resource for gathering data. However, I only conducted two interviews with each participant instead of three. Despite reducing the number of interactions with participants, I still asked questions that elicited data about the participants’ past and present experiences, as well as their overall experience in tripartite sequence during those interviews.

The multi-step interview method helped me advance the study’s trustworthiness in two ways. First, each interview acted as one source of data, and all participants were interviewed twice. Having two data sources allowed me to triangulate data by contrasting their responses between the two interviews. Second, I formatted the questions in the interview protocol to reflect both of Lee and Osyerman’s (2009) individual and contextual factors and Seidman’s (2006) three-interview method of phenomenological inquiry. Using this type of multi-layered approach, in and of itself, was a form of triangulation (Seidman, 2006).

The second method I used to help improve the trustworthiness of the study involved intuiting. By writing memos and keeping reflective field notes, I was able to provide rich descriptions about how participants valued their experiences, in addition to how they spoke and the tone in which they responded rather than relying on my own assumptions to interpret the data.
Throughout the explication process, I did my best to represent the participants’ perspectives in their own words, often extracting their comments from the interviews verbatim when developing themes. These note-taking techniques helped verify that each theme was generated directly from the data, which I also used as a form of triangulation (Creswell, 2009).

As a third method for establishing trustworthiness, I selected an individual sample of at least five participants. I did this to ensure that there were enough participants in the sample group to capture a significant amount of their viewpoints that directly related to the phenomenon (Kruger, 1988; Schwandt, 1997). In other words, the participants’ responses to the different types of questions I asked resembled one another so closely that I was able to develop a series of themes based on their shared perspectives throughout the interview processes (Moustakas, 1994).

Validity checking was the fourth and final method I used to enhance the study’s trustworthiness. After each interview was transcribed and summarized, I emailed participants composite summaries of their interviews. I also asked participants to make any changes or corrections and to return the summaries back to me within the next seven days. This was done to make sure that the summaries accurately captured how participants made meaning of their CGS process (Seidman, 2006).

This phenomenological study was designed to gain an understanding of how BWEMs construct idealized career-selves in addition to providing a description of the process they undergo when setting career goals during their senior year of college. This chapter has described the methodological approach I used to address the central research question and sub-questions posed in the study. Chapters Four and Five present the findings of the study.
Chapter Four

Overview of Findings

The next two chapters describe the findings generated from my data gathering and analysis processes using a phenomenological approach. I used multiple explication methods (Hycner, 1999; Swanson-Kauffman & Schonwald, 1988) to develop themes or clustered UOM that emerged from the most significant comments expressed by participants in the interviews. As mentioned in Chapter Three (pp. 56-57), I extracted UOM from all ten interview transcripts and compiled them into one super-list, which I then separated into several smaller lists consisting of comments that directly related to the three research sub-questions and an additional subset of questions about possible selves.

I organized Chapters Four and Five according to the participants’ responses to those four groups of questions featured in the interview protocol. Chapter Four focuses on their responses to the interview questions in alignment with Lee and Oyserman’s (2009) individual and contextual factors, while Chapter Five focuses on their responses to the interview questions about possible selves. More specifically, Chapter Four consists of the three sub-lists comprising the participants’ comments that best typified their past experiences, developmental contexts, and social contexts. I labeled these sub-lists using the names of each of the aforementioned factors, which became overarching categories. Once I had assigned all of the UOM to an overarching category, I began analyzing the comments within those sub-lists in greater detail. To provide further clarity regarding several terms that I will use to describe my explication process (i.e., categories, themes, clusters, UOS, etc.), I have included a table with definitions and examples in Figure 2 below.
<table>
<thead>
<tr>
<th>Name of Term</th>
<th>Description</th>
<th>Labels (or Examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overarching Categories</td>
<td>The general arrangement of comments based on the participants’ experiences in relation to the research sub-questions and questions about possible selves.</td>
<td>➤ <em>Past Experiences</em>&lt;br&gt;➤ <em>Developmental Contexts</em>&lt;br&gt;➤ <em>Social Contexts</em>&lt;br&gt;➤ <em>Individualized Clusters</em></td>
</tr>
<tr>
<td>Themes (or clustered Units of Meaning; UOM)</td>
<td>The assignment of the participants’ most significant comments to more specific groups, which are labeled according to relevant topics from the interview protocol.</td>
<td>➤ Category: Past Experiences; <em>Themes: Past Lives, Specific People, Becoming an Engineering Major</em>&lt;br&gt;➤ Category: Developmental Contexts; <em>Themes: Specific Steps, Specific People, Understanding CGS, What Mattered Most</em>&lt;br&gt;➤ Category: Social Contexts; <em>Themes: Explicit themes, Implicit Themes, Advice to Other BWEMs</em>&lt;br&gt;➤ Category: Individualized Clusters; <em>Themes: First Iteration, Second Iteration, Third Iteration</em></td>
</tr>
<tr>
<td>Units of Significance (UOS)</td>
<td>Sub-themes that emerged from the larger themes or UOM, which then generated additional clusters with more distinct labels.</td>
<td>E.g., Theme: Becoming an Engineering Major; <em>UOS: Coping with academic stress, Belonging in engineering, Career exploration</em></td>
</tr>
<tr>
<td>Varying Realities</td>
<td>Unique sub-themes (very specific comments) that emerged in connection with a particular UOS, which may or may not be shared across participants.</td>
<td>E.g., UOS: Belonging in engineering; <em>VR1: Don’t have specific goals, VR2: Lack of motivation/passion for engineering</em></td>
</tr>
<tr>
<td>Individualized Comments</td>
<td>Unit of Significance for the theme of <em>Understanding CGS</em>.</td>
<td>E.g., Category; Developmental Contexts; Theme: Understanding CGS;</td>
</tr>
</tbody>
</table>
Figure 2. List of explication terms, definitions, and labels.

Past Experiences

The first category I examined was *Past Experiences*, which includes the participants’ comments in response to the interview questions about their past lives prior to enrolling in college, the specific people who helped them shape their career goals, and the respective journeys they took in becoming engineering majors. These comments are grouped in this sequence based on the interview questions, which I identified as underlying themes from the category of *Past Experiences*. Therefore, I labeled them accordingly as *Past Lives*, *Specific People*, and *Becoming an Engineering Major*. A representation of the explication process for this category and its emergent themes is illustrated in Figure 3.
<table>
<thead>
<tr>
<th>Category</th>
<th>Themes</th>
<th>Units of Significance</th>
<th>Participant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wesley</td>
</tr>
<tr>
<td></td>
<td>Past Lives</td>
<td>Interest in Math</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Knowledge about Engineering</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR1: Recruitment Events/Summer Programs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR2: Parental Influence</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Deciding to Pursue Engineering</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Specific People</td>
<td>Peer Support</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR1: Healthy Competition</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Family Support</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR1: Ethnic Community Influence</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR2: Parent’s Occupation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Faculty/Staff Support</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mentor Support</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Becoming an Engineering Major</td>
<td>Coping with Academic Stress</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Belonging in Engineering</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR1: Don’t Have Specific Goals</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR2: Lack of Motivation/Passion for Engineering</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Career Exploration</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR1: Figuring Things Out</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR2: Receiving Appropriate Guidance</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VR3: Involvement with Supportive Communities</td>
<td>●</td>
</tr>
</tbody>
</table>

Figure 3. Category: Past Experiences with emergent themes and sub-themes.

Past Lives
When describing their past lives up to becoming an engineering student, the participants seemed to share similar experiences. As a result, three general sub-themes emerged, which include their interest in math, their lack of knowledge about engineering, and when they decided to pursue engineering as a career. I then clustered these UOM to form more distinct units of significance (UOS), labeling them just as they are mentioned above.

**Interest in Math**

The first cluster of UOS associated with Past Lives involves the participants’ proficiency in math. The majority of the participants acknowledged that they had a high interest in math while in high school. Wesley shared, “So, I went into engineering, especially because the usual thing for engineering students - They're like, ‘What got you into it?’ And I'm like, ‘I was good in math and science. . . . Okay, let's try it. Why not?’” Jennifer and Willow also mentioned having an inclination for math while in high school, and Renee developed her proficiency in math as early as elementary school:

I talked to one of my teachers and she was like, "Have you ever heard of engineering?" And she was like, "Well, it's more math and science, I think you'd be interested in it. . . ." I really don't like science that much but I can do it. Math is kind of what I like. (Jennifer)

I think it was around junior year that I wanted to do something in math and science. . . . Then, I decided I still wanted to do something in math. So, I kept thinking like, "I don't want to be a math major." So, I was thinking something like being a doctor or something, or a dentist. But I didn't want to work in the medical field. I still wanted to do something with math. (Willow)

I kind of chose it because I was always good at math. I was always two grade levels ahead. Yeah, ever since fourth grade. . . . I started going to a different class for some subjects. And then from there, when it came to math, I was always in a different group in the back of the class or a different room. Never knew how that came about but obviously the other stuff was too easy for me. . . . I like doing it. Science was a little more difficult and I always paced myself, but I love doing it and completing all the equations and problems that we had, which kind of made me want to do engineering. (Renee)

**Knowledge about Engineering**
Another cluster of UOS related to the participants’ Past Lives involves their knowledge about what the field of engineering actually entailed. Out of all the participants, Renee seemed to be the most aware and the most excited about pursuing engineering as a possible career. Not only did she know exactly what it entailed, but her interests rested solely in that choice of major:

I was just like, "Yeah, I'm going into engineering." I didn't really give thought to any other majors. Yeah, I don't know if that's bad that I didn't consider other majors but I was just like, "If I'm not doing engineering what am I going to do?" I haven't regretted it. I never had second thoughts. (Renee)

Jennifer and Jane knew almost nothing about engineering disciplines. Prior to enrolling in college, they both admitted to having to find out more about the profession first:

You always get the question: "What do you want to do when you grow up?" And I did not know, ever, and I still kind of don't know. I talked to one of my teachers and she was like, "Have you ever heard of engineering?" And I was like, "No, I have not. . . ." From there, I did a little bit of research on it, but not a lot. I thought it was better to apply to the engineering school rather than coming in undecided. (Jennifer)

Well, for me it's actually interesting because I didn't really know what an engineer was until I was a senior in high school. . . . But I actually started off wanting to just be a doctor, and then finding out what engineering was very late in the game. And then kind of just shifting my career focus towards engineering once I started applying for undergrad. (Jane)

Willow’s initial perception of engineering was fairly stereotypical. Prior to college, she thought of engineering as a profession that was reserved only for men, and she associated it mainly with auto mechanics:

But before that, I didn't really know what engineering was. I always associated engineering with mechanics. Like, working on cars or you see on TV how you're on the rollie thing, and you go under the car, and start working on stuff. So, like when people said engineering, I always said, "No, I'm not a man. I don't want to be an engineer. I don't want to work under cars and stuff. . . ." Then, my mom told me to research what engineering was, because I had the wrong idea of it. And that's not what engineering was. So, when I researched that there were multiple sub-disciplines within engineering,
that's when I was like, "Oh! This sounds really interesting. This is not actually just mechanics and working on cars all the time." (Willow)

Jennifer and Willow specifically mentioned that before they chose engineering as an undergraduate major, they had to first learn more about the different occupations that were included in the profession. Doing so required the participants to engage in opportunities that would expose them to college engineering programs. As a result, varying realities or unique sub-themes emerged for Willow and Jane in association with their knowledge about engineering, as they talked about attending recruitment events and summer programs that helped them explore engineering careers prior to enrolling in college:

I guess I should also tell you that I participated in a one-week engineering program at [the state flagship] over the summer. I think it was the summer before my senior year. I learned way more in one weekend at [the state land grant] and what they had to offer, more than I learned at [the state flagship] in one week. Also, at [the state flagship], I wanted to know more about their labs, and no one could give me information about systems engineering. Even the people in engineering there, and when I went to [the state land grant], I got tours of about eight labs... And the fact that they kept saying "hands on experience," and... they kept mentioning that you can get more experience - that most jobs hire a bunch of [the state land grant] students. And I knew I wanted a job as soon as I got out of undergrad, just in case I decided I didn't want to get my masters right after. (Willow)

I really didn't know what an engineer was. So, my mom and my dad, they sent me to an engineering camp at [prestigious historically Black university]. I stayed there for five weeks. I actually didn't want to go because I was like, in my mind, I don't know what I thought an engineer was, but it wasn't what like all the vast possibilities you have. That program really taught me all my options in engineering. And then it taught me about my current field of study that I'm going into - biomedical engineering. So, I guess that's how I started. (Jane)

Another varying reality that emerged in association with the participants’ knowledge about engineering includes parental influence. Three of them either had parents or their parents’ co-workers who encouraged them to increase their occupational knowledge about engineering as a potential career choice. Again, Jane’s parents sent her to an engineering summer camp to
expose her to engineering careers, Renee’s parents provided career trajectory somewhat by working in sectors related to STEM fields, and Willow was advised by her mother’s coworkers to look into colleges with strong engineering programs:

I grew up in a military family with my parents. So, we moved around a lot, had many different experiences. In terms of career-wise, both my parents are in the STEM field, the IT sector, but they never forced us to go a certain career path. . . . I don't know if I had any role models but I have plenty of family-friends that are in IT and the STEM field. Maybe that had some play into it. (Renee)

But then I spoke to a bunch of people that my mom works with, because she works in infrastructure, and, well, she's retired now, but works in urban planning. She works with a lot of architects and engineers. But, when I would go to her job events and speak to her co-workers, they always told me that [the state land grant] was probably the place for me because of engineering, and [the state flagship] is more of a theoretical school. I didn't like when people told me that, but I still took it as advice. (Willow)

**Deciding to Pursue Engineering**

Lastly, a third cluster of UOS focuses on the participants’ recollection of the exact moment in their lives when they decided to pursue engineering as a career choice. Each of them expressed that they began making considerations for engineering while still in high school. For instance, upon reflecting when she first considered pursuing engineering, Jennifer recalled, “This was in 10th grade, my sophomore year.” Wesley, Willow, and Jane all remembered having decided in high school as well:

When I decided? Yeah, it was high school, . . . and one of my friends was like, "computer science is really fun." And I was like, "I do like this class, computer science." And she's like, "Why not look into engineering?" So basically, that's how I was like, "Yeah, sure, I'll do that.” (Wesley)

About junior year, that's when I knew for sure I wanted to go into engineering. However, I still had that idea of wanting to go to [the state flagship institution] because I come from a [state flagship institution] family, rather than a [state land grant institution] family. I was so sure I was not going to [the state land grant institution]. (Willow)
Well, for me it's actually interesting because I didn't really know what an engineer was until I was a senior in high school. So, I wanted to be a doctor because I guess that's kind of just what people teach their kids, like be a doctor or be a lawyer. And the whole STEM movement wasn't really being pushed until I was in high school. (Jane)

However, Renee’s interest in engineering may have even begun as early as middle school:

I needed a challenge. Yeah, I needed to be challenged. And that carried on to when I moved again for middle school and high school. So, I was always so far ahead. I like doing it [math]. . . . But I love doing it and completing all the equations and problems that we had, which kind of made me want to do engineering. (Renee)

Despite having chosen to pursue engineering at roughly the same time in their respective educational careers, the participants all seemed to take their own unique pathways toward achieving those ends, as illustrated by the aforementioned comments. Wesley followed the suggestions of her classmates, Jennifer took the advice of a teacher, Renee chose to seek out her own personal interest in careers associated with math and sciences, Willow was persuaded by her family’s allegiance to institutional prestige, and Jane was influenced more by the prestige of certain professions over others. So, not only were the participants influenced by various encounters in their past lives that exposed them to engineering, several of them also noted that they were encouraged or inspired by specific people leading up to the time before they chose to major in engineering as well.

**Specific People**

When talking about the specific people in their lives who helped them shape their CGS processes, the participants mentioned several of the same types of individuals. Four sub-themes emerged, which include receiving support from peers, family, faculty and staff, and mentors.

**Peer Support**
The first cluster of UOS associated with *Specific People* in relation to the participants’ past lives involves peer support. The participants shared that their friends and classmates influenced their CGS processes throughout their educational journeys. For instance, Willow solicited help from high school peers who either took some of her same classes or participated in the same extracurricular activities with her:

The specialty program for my high school was IB, the international baccalaureate program. So, I hung out with a lot of smart people, and people that did AP classes. And, a lot of those people are also really good in math, so I guess I made a lot of math friends, and people that were on, I think it was the Robotics Team. (Willow)

On the other hand, Wesley, Jennifer, and Renee used their peers in college as guides to measure their career aspirations:

My friends, they shaped me a lot. . . . Yeah, so I had latched on to one of my friends. . . . She was gung-ho about material science. So, I was like, "Yeah, it didn't sound bad. I can go into biomaterials and stuff like that. (Wesley)

I think what pushed me forward was knowing that I could, I guess, if I completed it, I could help other people. That's kind of what's gotten me into NSBE and into the executive board. I feel like nobody really gave me the motivation. Nobody really told me how hard college was or how hard engineering was. So, I wanted to be that person, that voice - to be like, "Okay, this is what I had my freshman year, and I know you can do it." And guide them into ways they can succeed a little bit more. (Jennifer)

And then when I got to [the university], especially when you go to [the engineering living-learning community for women], I find that a lot of the friends that I have now or colleagues, classmates - we all have the same jobs. We're kind of in this circle, and because we have the same drive and motivation to be successful women in the STEM field. I feel like that started with [the engineering living-learning community for women]. Because we're all women, but we're also competitive and really smart. We want to go somewhere. I think it kind of started there. (Renee)

Wesley and Renee embraced their classmates’ support, which seemed to push them closer toward achieving their career goals. Somewhat conversely, Jennifer was motivated to help
others, which involved guiding her peers to be successful in engineering through student organizations like the National Society of Blacks in Engineering (NSBE).

One varying reality emerged in association with Specific People. This sub-theme particularly influences Renee’s CGS process, and involves the notion of healthy competition. She was the only participant who talked about developing a healthy competition with other engineering students when applying for internships and co-ops:

"Competition is good and sometimes you'll see people who are ahead of you and you think you should be there at that point in your life but it comes at a different time down the road. So, I remember freshman year, one girl who was also a freshman got a co-op. I'm like, "How is that possible?" So, I was kind of jealous but also congratulations to her. But my co-op didn't come until the next year. I was like, "I should be getting a job now, blah blah blah." Trying to push myself. So, I did some of the [minority engineering office] summer programs and then just kicked butt up until fall of sophomore year when I got my co-op. So, I went on co-op in spring. (Renee)"

Family Support

The next cluster of UOS associated with Specific People in relation to the participants’ past lives involve family support. Each of the participants felt as though their relatives encouraged them in their pursuit of engineering as a career interest. They mentioned how their parents and other older adults either inspired them or provided them with support prior to their beginning college. For instance, Renee’s family was an initial source of encouragement for her. She spoke about how excited her relatives were just to hear that she wanted to major in engineering. Renee recalled, ‘Yeah. I'd probably say it started with my parents and my godmother. They were like, "Oh, my baby's going to like engineering. That's so great."’

Additionally, Jane’s parents and grandparents not only supported her during her CGS process, they also provided her with a sense of purpose. She shared that they inspired her to continue building on their family’s legacy of education and upward mobility:
Well, I’d say the people that shaped my career goals the most have been my parents, just because they’ve kind of raised me and my sister to do better than them. So, they did better than their parents and they want me to do better than them. (Jane)

Willow thought of her mother as a professional role model, who served as a source of inspiration for her to pursue career goals as well:

My mom, she works in urban planning. For her whole life she worked for the City of [hometown], and worked behind [a U.S. senator], and the mayor for [hometown], and basically redeveloping houses and making houses more affordable. I got to go to a lot of her meetings, especially down at City Hall. . . . I thought that was pretty interesting because she loved what she did. She would always work more than she had to just because she loved her job so much. That's what I pretty much wanted to do. Make sure I enjoyed my job so much. Well, work, but also enjoy my job. Because she always says that if you enjoy your job, then it's not really a job. (Willow)

On the contrary, Wesley’s comments differed from the rest of her participant counterparts. She was more concerned with supporting her family financially rather than receiving support from them. One of Wesley’s motivating factors for pursuing engineering was so that she could help pay for her younger siblings to attend college. She said, “I would feel better if I was able to help my family, support them going through school. So, I was like, ‘This is one way that I could do that.’”

Based on the participants’ comments associated with family support and Specific People, two sets of varying realities emerged. These unique sub-themes involve the impact that their cultural backgrounds and their parents’ employment had on their CGS processes. The first set of varying realities includes comments from Jennifer and Jane in regards to their ethnic backgrounds as members of African communities.

Jennifer spoke about how much her ethnic community initially influenced her perception of which careers were more accepted based on her gender:
In a lot of African communities - I can speak for [ethnic subgroup] because that's what I am, but they go into the health field and more of the guys will go into engineering or computer science. So, I guess it was a little bit different but they’ve heard of engineering and they know that is a pretty successful career. So, it was a little bit different for them but because they knew it was something that I could get success off of, it wasn't that big of a deal. (Jennifer)

Similarly, Jane was influenced by her family’s ethnic background as well. However, she focused more on the value that her parents and grandparents placed on education and how they instilled a strong work ethic into her:

My grandparents are from Africa. . . . So, they were just kind of trying to live the American dream as far as like working hard. Not necessarily like having a career, it was more about getting on your own two feet. . . . Whereas, my mom was like just having an education was kind of like something that was being deemed as important back when she was a kid . . . She always encouraged me and my sister to do really well in school. They were very hard on us. . . So, my mom is very like, she was the type of mom that would make you do homework in the summertime, and she was never satisfied - which is good because I have high standards for myself, and I don't half-ass my work. I put a lot of dedication into being a good student. So, I would definitely say that that has to be with her and my dad, showing me the work ethic. . . . But I'm the first engineer in the family. Like I'm the first person to go into like a technical field, like that and I'm the first one to go to graduate school. (Jane)

Another varying reality in association with family support involves Willow and how her mother’s field of employment helped to influence the type of career she wanted to pursue:

It looked fun to me that, that's why when I went to [the state land grant university], . . . That's why I didn't go directly into civil [engineering], because I didn't want to make the decision thinking that I would try to follow my mom's footsteps. I wanted to see other things for myself. Then, it kind of led me back to that because I was like, "Well, I guess it's really what I want to do, because it seems so much fun." And it is fun. I love working on auto cad, civil [engineering], 3-D and designing, working on large infrastructure. (Willow)

Faculty/staff Support

Another cluster of UOS that emerged in the Specific People in relation to the participants’ past lives involves receiving support from university faculty and staff. Two participants
expressed having interacted with educators at their institution who offered to help them navigate their career pathways.

Renee sought assistance from university staff. She said, “In terms of people and organizations that influenced me, I would say definitely [the MEP office] and the people I've met through [the MEP office].” Wesley, on the other hand, had direct conversations with her engineering professors, which helped influence her CGS process:

I think it was during [summer transition program for first-year engineering majors], I had a meeting with Dr. [faculty member]. He's a material science professor. And he was so excited about it. He's like, "Materials are everywhere. You know, they're everything. You can always get a job." That was another thing, I was like, "Oh, jobs. Yes! That's what I need. Okay." That was one thing that sold me. (Wesley)

**Mentor Support**

A fourth cluster of UOS related to *Specific People* in relation to the participants’ past lives involves networking with academic and professional mentors. Two participants mentioned having been assisted by mentors throughout their respective CGS processes.

Wesley was influenced by a Black woman engineering graduate student who she said pushed her throughout her college career. Wesley added that, “She's signed me up, giving me professors to talk to, helped me write an email to them.” Similarly, Renee shared that she was seeking advisement by professional engineers at her internship site. She placed a large emphasis on, “getting mentors and talking to professionals in the industry and people who have gone through the engineering program here at [the university] or other schools.”

So, both participants benefited tremendously from being mentored by older engineers. Wesley’s mentor encouraged her to develop relationships with her professors, which helped contribute to her academic success while in college; and Renee’s mentors helped guide her efforts to advance her career after she graduated from college.
Despite having received widespread support from peers, family members, faculty and staff, and mentors who aided them in establishing solid foundations for pursuing careers in engineering, the participants also encountered a variety of challenges en route to becoming engineering majors as well.

**Becoming an Engineering Major**

When asked about how they became an engineering major and what factors influenced their decision, three types of concerns seemed to emerge from the participants’ responses: struggling or coping with academic stress, having a passion for or attachment to engineering, and exploring the different majors or career options within engineering. In addition, the participants also exhibited varying realities associated with exploring various fields of engineering, as they were challenged with “sorting out” which major was the best fit for them given their interests and/or career aspirations.

**Coping with Academic Stress**

The first cluster of UOS that emerged in association with *Becoming an Engineering Major* includes the participants’ comments about how they encountered academic stress, particularly during their first two years of college. They all mentioned having to cope with the rigors of becoming an engineering major in their own different ways.

Wesley worried about just getting through her coursework as an engineering student and wanted to avoid switching her major:

> And by sophomore year, I was like "Nope, we're here. We're not moving." I went to this speech one time. . . . She was like "Find your passion. If you have to switch majors five times." I'm like "Are you paying for my switching majors?" I only got so many years that they're going to help me pay for. I can't. I'm not. If I need to switch, I'll do it later. I'm okay with going through, getting it. (Wesley)
Jennifer also talked about being on the fence and struggling with her general interest in engineering as a first-year student:

If you know you want to do engineering, I guess, that's good for you. You can go in and can see what you like. But then, for the people who are struggling and are on the fence - I know a lot of people I came in with freshman year, they dropped it because they were struggling so much freshman year. But then if you're on the fence, it's so much easier for you to go and be like, "Wow, this is so boring. I don't even understand why I'm here." I said that personal one-on-one conversation I had with that senior definitely made me stay. (Jennifer)

Willow expressed fears of failing out of engineering, and Jane wondered if she would even be able to get into engineering:

Your first thing is to [be] like, "Oh my goodness, I'm going to fail out! I'm just going to drop out so I don't get bad grades. I'm just going to do something like psychology, or whatever." But, you notice that everyone else is struggling too. So, you help each other with engineering courses. Your second instinct isn't to drop out because you realize that everyone else is in the same boat as you. (Willow)

And so, I originally actually didn't get into the engineering program, and so I was kind of discouraged because I'm like can I still get in? . . . I actually talked to somebody in the engineering department or something like that and they basically were like, “Yeah, it's going to be pretty difficult for you to get into the engineering program without being in it already. . . .” Back when I was a freshman you had to keep a 3.0 [GPA]. And then there was like a certain set number of classes you had to take. And then so, because of that, I had to take some classes in the summer to make up for it. I think it took about a year and a half. (Jane)

Renee felt so pressured that she needed a break and sought escape by participating in internships and co-ops:

Freshman and sophomore year are the most stressful years of college, especially when you get through all those classes. And I always make a joke, when I got my co-op, they asked me, "Do you want a summer internship or a co-op?" And I was like, "I'll do a co-op." Because that fall semester sophomore year was my worst year ever, just mentally and also academically. So, I was like I'm running away. I always feel like I ran away that spring semester and just worked for spring semester and just came back in the fall. It was exactly what I needed because I just needed a break. (Renee)
Belonging in Engineering

The second cluster of UOS associated with Becoming an Engineering Major involves whether or not the participants felt as though they belonged in engineering. Their comments related to whether or not they felt attached to or passionate about a particular field of engineering.

Wesley realized that she lacked the same enthusiasm for engineering that her classmates seemed to possess, and Jennifer struggled to retain her interest in majoring in engineering altogether:

And I've never been very attached to engineering. Especially, the engineering I'm in, materials science. I don't hate it. But I would definitely switch if I had the chance. . . . I've never hated it. But I don't have a passion for it. I don't have a drive for it. It's like "I'm getting through the classes. So, I'm just going to continue going through the classes. . . ." I can tell that I don't think I belong in this major because the way that other people view these labs. They'll be like "Oh yeah, this does this. And this does that. And this affects this." And I'm like, "Look, this happened and I don't know why. It's just kind of cool." Because, I don't care as much like that. It's just not something that interests me like that. (Wesley)

I talked to a senior, my freshman year, when I was thinking about getting out of engineering because I was like, "I don't like anything. Not only is it hard, but I'm not interested in anything. . . ." I guess having that one on one conversation with somebody else, that person was just trying to see where my interest lied [sic] and gauged what I liked. And then, through that conversation, led to industrial and systems engineering. Then I did a little more research on that and I was like, "I guess if I'm staying, this is what I'm going to go with." Again, it's not something I love. (Jennifer)

Jane experimented with several majors in hopes of finding an engineering discipline that aligned with her interests. However, two years later, she finally settled on a major that met her satisfaction:

So, I started off in general bio science, but also knowing that I wanted to go into engineering. Then, I originally applied for engineering, science and mechanics. And so, I was in that major. But after two weeks, I was like, "This is not for me." And I hated it. So, I spent that whole sophomore year like trying to figure out, okay like this is what I
thought I wanted to do, trying to change tracks. So then, I started looking into the other majors and I settled on material science engineering, because I could do that and I could also have the biomedical engineering minor. And so, it worked out great. I love my major. I'm glad with the decision I made. (Jane)

Renee’s interest in engineering did not manifest until she began engaging in internships and co-ops. Once she started to participate in those experiences, her attachment to engineering grew significantly:

I don't think I have a set experience where it was like, I'm going into engineering. It was just, “Yeah, I'm going into engineering. Okay, that's cool. . . .” Because coming in as a freshman, or just being an underclassman in college, I didn't realize this but looking back on it and talking with my friends about it. . . . Dealing with the anxiety of wanting to make friends or have your social group picked out but also balancing schoolwork and trying to get an internship because you need to be successful. You need an internship to get the job. All these different experiences. . . . Obviously, it [co-op] was a good experience and I made some money on the side. Going through those experiences didn't deter me away from being in engineering. I think it's just something you have to go through just to realize your worth and also your strength and what you're able to do. (Renee)

Within the UOS clusters in association with Belonging in Engineering and Becoming an Engineering Major, two varying realities also emerged. One unique sub-theme involves participants’ comments in relation to actually setting career goals. Prior to her remarks about being unattached to engineering, Wesley also admitted, “I don't have very specific career goals.” On a similar note, Jennifer shared, “I mean, I heard of it [engineering]. I did very, very minimal research. I'm the type of person who likes to go with the flow, live day by day. I don't have everything planned out. I believe everything will fall into place.” Therefore, both participants talked about not having set career goals or following a structured plan.

Another unique sub-theme associated with Belonging in Engineering and Becoming an Engineering Major involves participants' comments about having a lack of motivation or passion toward their particular major. Wesley expressed a lack of enthusiasm about her major, relaying that, “I've never hated it [materials science engineering]. But I don't have a passion for it. I don't
have a drive for it.” Jennifer reflected on a discussion she had with a senior engineering student about staying in engineering:

Through that conversation, led to industrial and systems engineering. Then, I did a little more research on that. And I was like, "I guess if I'm staying, this is what I'm going to go with." Again, it's not something I love. (Jennifer)

Renee was even self-critical, questioning her motivational interests, and referred to herself as “lazy”:

All the work I had to do then - I don't want to do it now, but that's only because I'm lazy. I'm like, “How did I have this motivation two years ago?” I need to find it. There's a lot of factors also playing into my lack of motivation right now. (Renee)

*Career Exploration*

The third cluster of UOS associated with *Becoming and Engineering Major* involves the participants’ exploration of majors or careers within various fields of engineering. Wesley seemed to be the most vocal about this part of her process. She talked about hands-on activities and labs and how they captured her interest, which led her to choose material sciences engineering as a major:

I would probably prefer mechanical, just because it's probably more hands-on, and what my materials science stuff is. It's more chemistry-based, which is fine. . . . And I haven't tried the field that I actually want to try going into. I want to go into biomedical. . . . I've wanted to go into biomedical since sophomore year, probably - but they don't have it here. So, I was like, okay. So, that's another reason why I chose material science out of all of the other ones. Well, they have, another thing was they had labs. They were like, they sold me on the labs. And so, that's hands-on work and stuff like that. And I have enjoyed the labs a lot. They were really fun. . . . That's, honestly, what I'm looking for. I just want a hands-on job. When I was working with [prominent engineering company] and stuff like that, I was sitting at my desk like, "Okay, got to do this." And I'd type and stuff. And then I'd go out into the shop floor and I'd be like "I want to be the people on the shop floor messing with the parts." Like, I don't want to be at the desk looking at stuff like that. (Wesley)
Jane spoke more about selecting a university that would give her the best options for pursuing the career of her choice. Both she and Wesley took paths they thought would help them achieve their goals of becoming biomedical engineers:

I talked to you about like my transition from wanting to be a doctor to like, “Oh maybe I want to be like a biomedical engineer.” So, I applied to a bunch of schools. [The university] was one of them. I actually applied to [the university] last, because I didn't actually really want to go at first. And my mom was like, “Oh no, you need to apply to some [home state] schools because it's a better deal. . . . [The university] is a really good school if you want to go into engineering.” (Jane)

Within the UOS clusters, three sets of varying realities also emerged in association with *Career Exploration* and *Becoming an Engineering Major*. They involve participants’ comments in relation to figuring things out, not receiving appropriate guidance, and participation with supportive communities. The first unique sub-theme consists of statements and phrases the participants used such as “sorting” and “figure out” to describe their initial CGS process when deciding what they wanted to do professionally:

There's a lot of sorting. And to do that, and especially, when they want you to decide the second year that you're here, to do that when the classes that they give don't really even - they don't dive into any of the engineerings [sic]. How are you supposed to figure out which one you want? . . . Especially, the introductory class for engineering, it doesn't do much exploring into engineering at all. It doesn't help you necessarily decide what major you want to go into. It doesn't help you decide, "Yeah, I want to go be a chemistry engineer." It doesn't give you actually any experience what that field is going to be like. (Wesley)

Essentially, they seemed dissatisfied with how engineering careers were presented to them as part of their introductory courses, which required them to attend information sessions aimed at helping them explore the various majors within engineering. Wesley complained that, “They want you to decide the second year you’re here. . . .” referring to the misguided intentions of engineering faculty. Agreeing with Wesley’s sentiments, Jennifer added, “They made us go
to informational sessions and stuff, and I don't really think that gauges your interest. It bored me even more.”

Jane also struggled with figuring things out and finding an engineering major that fit her interests. As a result, she began to make critical decisions independently and navigated her career path without receiving counsel from faculty:

So, I started off in general bio science, but also knowing that I wanted to go into engineering. Then, I originally applied for engineering - science and mechanics. And so, I was in that major. But after like two weeks, I was like, this is not for me, and I hated it. . . So, I spent that whole sophomore year like trying to figure out, okay like this is what I thought I wanted to do, trying to change tracks. So then, I started looking into the other majors, and I settled on materials science engineering because I could do that, and I could also have the biomedical engineering minor. (Jane)

Another set of varying realities associated with Career Exploration and Becoming an Engineering Major emerged, which involves Receiving Appropriate Guidance. Again, Jennifer was advised by a high school teacher to pursue engineering as a college major:

I talked to one of my [high school] teachers and she was like, "Have you ever heard of engineering?" And I was like, "No, I have not." This was in 10th grade, my sophomore year. I said, "No, I have not heard of it." From there, I did a little bit of research on it but not a lot. I thought it was better to apply to the engineering school rather than coming in undecided. (Jennifer)

Also, Jennifer previously mentioned how much she struggled to find a sense of belonging in engineering during her first year of college, but was later encouraged by an upperclassman to stay in engineering. As a result, she was then able to choose a major that aligned with the types of engineering careers she was interested in:

I talked to a senior, my freshman year, when I was thinking about getting out of engineering because I was like, "I don't like anything. Not only is it hard but I'm not interested in anything. . . ." I guess having that one on one conversation with somebody else, that person was just trying to see where my interest lied [sic] and gauged what I
liked. And then, through that conversation, led to industrial and systems engineering. (Jennifer)

Jane talked about how she had received both negative and positive forms of guidance en route to becoming an engineering major:

A funny story. I actually talked to somebody in the engineering department or something like that and they basically were like, “Yeah, it's going to be pretty difficult for you to get into the engineering program without being in it already.” So, I was kind of like, “Oh, I don't know.” But actually [Black woman senior engineering faculty], I ended up talking to her. And she was like, “No. That's not true.” She's like, “You definitely can get in. All you have to do is this, this, and this; and we'll help you. I'll put you in the [student transition] program [for engineers].” She was one of the reasons why I went to [the university] because I didn't think that it was going to be possible. And she was right. It really wasn't that bad, but I just had to kind of buckle down on my studies. And then, I did a couple of classes during the summer. Then I was able to apply for the engineering program, and I got in. So that's kind of how I got in into engineering. (Jane)

The third set of varying realities associated with Career Exploration and Becoming an Engineering Major emerged, which involves participating with supportive communities.

Entering her first year of college, Renee was largely concerned with establishing a circle of friends that would provide her with social support. She recalled, “wanting to make friends or have your social group picked out but also balancing schoolwork.”

Similar to Renee, Jennifer sought peer support, but she also looked for same-race peers in engineering:

There's not a lot of Black people here, in general, but then a lot of the Black people who do come here are not in engineering so that makes it a little bit more difficult. And then coming in my class, we did not have a lot of engineers. But the class after, they came in very tight knit and they had a lot of engineers. I guess it would have been a little easier for them to stick together. Whereas for me, when I was on the fence, when I was like, “Should I leave or not,” it would have been more easier [sic] for me to fall off because I didn't have any Black engineering friends or I didn't come in with anybody who was an engineer. (Jennifer)
Willow valued participating in an all-women’s living learning community alongside her same-gender peers:

When I got accepted to [the state land grant institution], I actually didn't know anything about [the engineering living-learning community for women]. . . . When I was looking for roommates, I was talking to this one girl, and she said, "Oh, I got accepted into the [engineering living-learning community for women] program. We can only be roommates if you're rooming in [the living-learning community residence hall]." I said, "Wait, what does that mean?" So, I went online and did some research, and I realized that was an engineering living-learning community, and that's what opened my eyes up to [the minority engineering program office] and everything. (Willow)

The participants’ comments related to their need for support systems involving same-race or same-gender peers and the MEP office were not only reserved for the category of Past Experiences in describing how they became engineering majors. They also spoke about both topics in detail when responding to questions from the second interviews, as similar sub-themes emerged in the subsequent category of Developmental Contexts as well.

Developmental Contexts

During the second interviews, I asked the participants several questions related to their developmental contexts, which focused on their current academic, occupational, and interpersonal experiences that took place throughout their final year of college. Therefore, I named this category Developmental Contexts. It consists of the participants’ comments in response to the interview questions about the specific steps they were taking in setting career goals, the specific people who were helping them accomplish those goals, their general understanding of their CGS process, and what they felt mattered the most about their CGS process at the time of interviews. I grouped their comments in this sequence according to the interview questions, identified them as underlying themes, and labeled them as Specific Steps,
Specific People, Understanding CGS, and What Mattered Most. A representation of the explication process for the category of Developmental Contexts is illustrated in Figure 4.

<table>
<thead>
<tr>
<th>Category</th>
<th>Themes</th>
<th>Units of Significance</th>
<th>Participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental Contexts</td>
<td>Specific Steps</td>
<td>Seeking Employment Opportunities</td>
<td>Wesley</td>
</tr>
<tr>
<td></td>
<td>VR1: Having a Purpose/Making an Impact</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Preparing for Graduate School</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Preparing for Leadership and Management</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Specific People</td>
<td>Guidance from Mentors</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>VR1: MEP Office Support System</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>VR2: Need for Peer Support</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Guidance from Family Members</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Managing Financial Priorities</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Making Adjustments</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Competing with Peers</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>All sub-themes were individualized.</td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>What Mattered Most</td>
<td>All sub-themes were individualized.</td>
<td>Financial Stability</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Lack of Guidance/Parental Advice</td>
<td>Transition into the Professional World</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>Reaching Goals</td>
<td>Managing Adulthood</td>
<td>●</td>
</tr>
</tbody>
</table>

Figure 4. Category: Developmental Contexts with emergent themes and sub-themes.
Specific Steps

When talking about the specific steps they were taking as part of their CGS processes, three general sub-themes emerged based on the participants’ responses. The participants mentioned activities such as seeking employment opportunities, preparing for graduate school, and preparing themselves for leadership roles after establishing their careers.

Seeking Employment Opportunities

The first cluster of UOS associated with Specific Steps involves seeking employment opportunities. The participants mentioned that they spent much of their time looking for full-time jobs. For instance, Jennifer was often preoccupied with job interviews and searching for internships:

I am still interviewing with different jobs, and companies, and stuff, so I’m waiting to hear back from some companies. I’ve been looking for full time jobs. . . . And I was just thinking yesterday, if I do want to go to grad school. And now I have to start looking for internships rather than full time jobs. (Jennifer)

Wesley was also concerned with finding a job, as well as pursuing research opportunities that would increase her chances of securing employment in the biomedical engineering field:

Schooling and stuff and if you get good grades in school or whatever, you work hard and you make sure you learn the material. . . . So just making sure that I get a job. Those are the only two things that I’ve really been doing. . . . Well, for biomedical, I keep on trying to like get involved in research. I haven't gotten there yet. Being involved in research for that. (Wesley)

Along with seeking employment opportunities, a varying reality emerged in association with Specific Steps, which includes the participants’ need to find purpose in the types of engineering careers they were pursuing. Jane was the most vocal about this topic and
proclaimed, “I have to have a purpose for doing something or else it's hard for me to do it. . . . If I'm not motivated to do something, I won't do it.” She also discussed wanting to make an impact in what she did for a living:

I'm also trying to narrow down what it is specifically I want to do and what I want to focus on. . . . Because I guess my main goal is to do something that has an impact. Really any project that I've been on since I've been at [the university], I'm like okay, how is this impacting other people? . . . I want to make a lasting impression on this world before I leave. . . . So, I feel like helping people on the medical side - because I always thought that in order to help people medically you have to be a doctor, but that's not necessarily true. For example, I was able to work on a drug delivery system, making it more user-friendly. There's literally people who won't take their medicine just because of the way you have to take it. They just don't want to. So, making it easier for people to gain access to their medicine, easier use, stuff like that. (Jane)

On the contrary, Jennifer struggled to align her employment search with the type of job she felt connected to, sharing that, “I've been applying for supply chain, and manufacturing jobs, and stuff, and that's not really my passion. So, I don't think they could pay me enough to be like, ‘I'm coming here for the rest of my life.’”

Again, Jane expressed that she was taking steps to select a career that made a difference in the world and allowed her to help others:

Is this something that is translational, something that can help others? Or is it just something for my own personal gain, or something that doesn't really matter? . . . I'd say I've always had that desire to help others. I mean it was something that was just like instilled in me from being a young child. My family always was like, people have given to us and helped us, so that it's important to pay it forward. . . . So, I feel like helping people feel better, it helps them in so many other arenas of life, because if you don't feel good you don't want to do anything else. (Jane)

Conversely, Jennifer was mostly focused on finding job opportunities that were located close to her immediate family. She admitted, “Like I talked about last time, I really want to live close to my family. If the deal isn't sweet enough to put me in that sweet spot geographically . . . I don't think anything could sway me.”
Preparing for Graduate School

The second cluster of UOS associated with *Specific Steps* includes the participants’ comments about how they were preparing for graduate school. Jane and Jennifer were both making plans to apply to graduate school after completion of their senior year.

Jane was certain that she wanted to earn an advanced degree, but she was unclear as to which type of degree she wanted to ultimately pursue. She said, “I plan on going to grad school. Still trying to decide if I want to go and to do the Masters or Ph.D., because I'm not sure if I really want to do a Ph.D. yet.”

When describing her potential plans to prepare for graduate school, Jennifer talked about needing to plan financially, study for entrance exams, and seek graduate assistantships:

So right now, I'm trying to work, get myself together financially. . . . Hopefully, my GMAT test, I want to start preparing for that starting from next weekend. I think I'm just going to spend weekends in and just study because I thought of this late. So, I don't have enough time to take my time with these tests. They're expensive. So, I want to make sure I do well on it. So, it's like studying up at the library. . . . And I’ve been looking for full-time jobs. And I was just thinking yesterday, if I do want to go to grad school and now I have to look for internships rather than full-time jobs, that's another thing I have to set up . . . Because I've been doing well looking for full time jobs, but now I need to restart - look at different companies. . . . Right now, I’m looking for internships, getting ready for the GMAT. I’m trying to get an assistantship in order. . . before I make my final decision about coming here for schooling. Because if my schooling isn't paid for, I will not be coming back. (Jennifer)

Preparing for Leadership and Management

The third cluster of UOS related to *Specific Steps* involves the participants preparing themselves for leadership and management positions. This theme primarily consists of comments from Renee and Willow, both of whom were candid about their aspirations to be employed in leadership positions at a major engineering company. Renee mentioned that she
was participating with a rotational leadership program at one of her previous intern sites to illustrate what steps she was taking as part of her CGS process:

I guess one of the steps that I am taking is being a part of the development [rotational] program, which works on numerous aspects of making myself better professionally in terms of making those connections with people throughout [prominent engineering company], seeking out mentorship. . . . I think really the overall goal of the program is to shape you as a [premiere engineering company] leader and to kind of go far within the company. That's also kind of why I want to do it, to make myself more comfortable and also just gain that experience, in order to be in a management position, I suppose.  
(Renee)

She also provided an explanation for why she wanted to develop herself as a leader in that way:

I don't foresee myself going in a more technical route. . . I always thought I'd go more management style. So, I guess that's one of the steps I'm taking to get there, and also just to make a name for myself and develop myself with the company that way. Because they're investing in me, and I'm investing my time with them. So, it's like a mutual benefit that they get. Obviously, they saw potential in me, which is why they hired me I suppose. I was really excited to get that call, to go and do the program with them.  
(Renee)

Willow chose to take a different approach in preparing herself for future management roles in engineering. In doing so, she was involved in several leadership positions associated with her living-learning community:

I was a freshman in [the engineering living-learning community for women], then sophomore year I was on the Service Learning Committee, as well as a mentor. I knew I wanted to either be a mentor liaison, or on the [living-learning community] Leadership Team. So, I decided to be a mentor liaison, but on one of the committees, and lead one of the committees. . . Leading a group of people will kind of help me for the future. I was a committee liaison for Professional Development and that was the first time I led something with someone, in general. (Willow)
Willow described the steps she took to develop as a leader as well. She talked about the challenges that she experienced and how she learned to manage conflict and communicate as part of a team, skills she can use when working with other professional engineers:

But that was also the first time where we had conflicting views for the committee. . . . So, I really feel like working someone with conflicting views, and that's completely different than me is going to really help me in the future because you're going to be working with a bunch of different people with a bunch of different backgrounds. . . . But then, I realized that you have to just keep going and be able to communicate and have open communication because there are going to be a lot of people like that who you run into. You can't just be a baby about it. You have to talk to them and be like, "Hey, I want to incorporate this new thing to the committee and to the team." (Willow)

Specific People

When talking about how specific people in their lives were presently helping them achieve their career goals, the participants mentioned that they were influenced by a variety of individuals. Based on their comments, two sub-themes emerged, which include receiving guidance from mentors and family members.

Guidance from Mentors

The first cluster of UOS associated with Specific People in relation to the participants’ developmental contexts involves comments about mentors who assisted them throughout their educational careers. Each of the participants shared that they all had mentors who assisted them in either setting or achieving their career goals.

Renee was open to having a range of mentors, which she used to provide her with guidance:

If I need help or need specific guidance, I have no problem asking any of my friends or family or mentors for their input and support. They'll help me in any way they can, or they'll just point me in the right direction. . . . This is basically everyone in my life, in terms of friends, family, mentors, and coworkers I've met. They're very supportive. I've
never had anyone say, "Oh, don't do that." Unless like they think it would absolutely ruin my career or something like that. (Renee)

Whereas, Jennifer solicited help from select faculty members to help her secure research opportunities after she experienced several academic difficulties early on:

I was really only close to maybe like two professors or something. Those are the two professors I would go to for letters of recommendation, or just to talk about what's going on in my life academically, or try to figure out different opportunities. Because coming in freshman year, I had a high GPA. But then after freshman year, I didn't have a high GPA. So, I needed to get opportunities to make myself stand out rather than just my GPA - so, research and stuff. (Jennifer)

Wesley, Willow, and Jane were all assisted by a Black woman graduate student who worked in the minority engineering programs (MEP) office and served as a mentor for them throughout their college journeys. In addition, Willow mentioned a woman administrator who also worked in the MEP office, and Jane mentioned a Black woman senior faculty member, both of whom were influential to their CGS processes:

Yes, I think [Black woman graduate student] is she's probably the most involved. I don't think she's that much involved but that's only because I'm not a very close-knit person. With [Black woman graduate student], I feel that she'll give you as much as you take, kind of thing. And I don't reach out to her as much as I should for help about stuff like that. (Wesley)

I know [woman administrator]. All the time, she's saying, "What do you need from me? Is there something you need from me for the committee? . . ." It was the summer right after my freshman year, that's where I met [Black woman graduate student]. But, people like her. . . So, she makes an effort to bring everyone together and talk about what they're going through and not hide it. I think people like her is what keeps people, or I guess, undergrads in engineering like me, pushing forward. (Willow)

And I've always had people like [Black woman graduate student] and [Black woman senior engineering faculty]. That if I need help or the resources to help me in something, they always know where to go to or if they don't know, they'll find it for me. They actually care about me, which is really important to me. (Jane)
Based on the participants’ comments associated with mentors and *Specific People* in relation to their developmental contexts, two sets of varying realities also emerged. These sub-themes involve the participants identifying the MEP office as a resource for mentors and the participants identifying their peers as mentors.

The first set of varying realities includes comments from Willow and Jane about the MEP office in serving as a support system for them during their time at the university. Willow felt connected to the staff, who provided her with career counseling and promoted her to develop as a student leader:

"The [MEP office] has helped me so much. I don't think I'd be here without it. I definitely would have dropped out of engineering by now because I think working with [the minority engineering programs office] - no matter what leadership position you're in, or even if you're not in one - they always make an effort to be available. There's always someone walking around saying, "If you need me, I'm in this office. If you want to talk, here's my email. We can talk about this. If you have any questions, or you're not sure about career goals, you can talk to me about this." (Willow)

Jane also felt as though she benefited from the support system provided by the MEP office and other resource groups geared toward minorities in engineering:

"And then just having a support system at [the university] has been important, especially as a Black student in a mostly White school. Having groups like NSBE and the [MEP] office and stuff like that has really helped me realize that I'm not alone. (Jane)"

The second set of varying realities associated with mentors and *Specific People* involves the participants’ need for peer support. Wesley, Willow, and Jane each considered the feedback they receive from peers as an essential part of their CGS processes.

Wesley used her classmates to help her stay on track of academic and professional requirements and milestones that were germane to the experiences of engineering students:
I feel like I just got to do basically whatever I hear other people and I'm like, 'Oh'... For example, I hear people this summer I hear people that are like, “I'm going to go study for the FE exam.” I was like, “What in the world is the FE exam?” I've been in class for four years and I don't know what that is. And I didn't know it was a thing for engineers and stuff. Now I'm coming out, and there's another exam we have to take before you can even become a professional? Something that I'm like, “Well, now that's another thing on my checklist to go look into. The FE exam. . . .” So then mostly my like career goals those things come from like peers and stuff like that. Talking to peers and you're like, 'Oh what're you up to?' 'Oh, you're interning?' Oh, I should be interning, okay, I'm going to do that then. Or like, 'You're researching?' Okay maybe I'll look into researching. (Wesley)

Participating in an academic support group was cathartic for Willow. She used those opportunities to have open discussions with her peers and to solicit their advice about issues related to her major:

Obviously, I don't think I would have joined [minority engineering academic support group] if it weren't for [engineering summer transition program] and knowing her [Black woman graduate student]. Because I would have been like, "What the heck is [minority engineering academic support group]? . . ." I realized that actually talking it out with other people and having those meetings was really helpful. Actually, voicing what you're going through actually helps you make decisions. (Willow)

Jane also expressed that she needed peer support. Having struggled to connect with others during her freshman year, she suggested that making friends should be a priority for all students, especially STEM majors:

And then just having friends that are going through the same thing that also helps. . . . I would say that's one of the biggest pieces of advice that I usually give to young students that I meet a lot of times, especially when you're in a technical field, you have people who are more reserved and more introverted, and so they have a hard time making friends. But I always tell them, "You will not make it through college. Even if you make it through academically; emotionally, you need at least friends. Find at least one to two good friends, because you'll have a lot of acquaintances, but find at least one friend that you can talk to and trust, so that you can get through the tough time. Even if they're not in your major, just find somebody. Find a group of people that you can relate to, . . ." That was one thing I struggled with a lot my first year is making friends. College got a lot easier and more fun when I started expanding my horizons a little bit. (Jane)

**Guidance from Family Members**
The second cluster of UOS associated with *Specific People* in relation to the participants’ developmental contexts involves comments about their family members and how they have guided and supported them during college. Three of the participants mentioned family members as playing a significant role in their CGS processes:

Renee’s family respected her independence in making career-related decisions, but still offered her advice on occasion:

> So, I'm going to do what I want anyway, which gets on my parents’ nerves. So, they just create this environment of just being supportive. . . . They'll give me advice, like maybe you should think about these options and do this, and they'll guide me. But ultimately, they respect the decision that it's ultimately my choice, at the end of the day. (Renee)

On another note, Jennifer and Jane relied on their families primarily for emotional support:

> Most of it has been through freshman year, and a little bit of sophomore year. But after that, I really had to grasp certain emotions, and go through stuff for myself. . . . Yeah. So, family is mostly emotionally, which was a few years ago. And then, not really financially because I do have a scholarship. They're my motivator, so like I was saying before, other people probably see something in me more than I see myself. So, they're the people who go, "You can do it, and you're so smart," and they give me the words of encouragement. (Jennifer)

> My family alone, they're very supportive. If I ever need anything - mostly my mom. If I didn't have my mom, I would not have made it through. . . . I wouldn't have gotten into college, I wouldn't have stayed in college, and I wouldn't be going to grad school, because she's emotional support. . . . She's the person that calms me down a lot. At the end of the day, I'm always freaking out and she's like, "Well if you fail, you fail. We're still going to love you no matter what." And so, she's the one. If I'm stressed out to the max, she's the first person I talk to, because I know I'm going to feel better after I talk to her. (Jane)

**Understanding CGS**

After asking the participants how they understood CGS and what that process meant to them, they each responded in vastly different ways. Their comments varied depending on their
individual sources of motivation and respective experiences as students majoring in engineering. As a result, four general sub-themes emerged. They include managing financial priorities, making adjustments, competing with peers, and allowing things to fall into place. In addition to those comments, another set of themes also emerged, which I organized into individualized comments.

Managing Financial Priorities

The first cluster of UOS associated with Understanding CGS involves the participants’ attempts to manage their priorities, particularly those related to their finances. Renee thought of CGS as her responsibility to create long-term plans for her professional advancement in industry as well as eliminating her student loan debt even before entering the workforce. On the other hand, Wesley’s perception of CGS was largely influenced by her financial conditions in trying to pay for college. Despite wanting to pursue another engineering major, she chose not to switch because she was concerned about not being able to afford the extra time in college:

"It's always about management of my time, my money, and kind of getting to that next step, like a power-position. With my parents, it's always like handle your money now, make sure you're set, make sure you're good. Pay off part of your debt, because you don't want to be where we are at right now. They're maybe more longevity aspects, like financial stability... Yeah, like managing money, always having goals. (Renee)"

"From there, I just sort of stuck with what I had because it was a financial situation. This was my process. My financial situation kept me on the same goal of like now, and I'm adjusting slightly, trying to make it so that I'm happier. (Wesley)"

Making Adjustments

The next cluster of UOS associated with Understanding CGS involves the participants having to make adjustments in executing their CGS processes. Jennifer was familiar with falling short, and then having to modify her approach before reaching a goal. Similarly, Willow
expressed that she manages setbacks by staying optimistic and looking for valuable lessons with each situation:

A lot of ups and downs. I feel like you're never going to, maybe not the first time around, meet some of your goals that you intended for yourself probably before coming in. A lot of adjustments and you have to be able and willing to do certain things for certain companies to get a job. (Jennifer)

I know for me, if I don't write down a satisfactory goal, I won't be happy with falling back. I'm going to be stressed out the entire time, and it's not good to be stressed out. . . . It's okay to be upset about not reaching something. But then, you need to change your mindset around and make a positive thing out of it. I think I've learned that a lot freshman year. Worrying about something doesn't help the situation. (Willow)

**Competing with Peers**

Another cluster of UOS associated with *Understanding CGS* involves the participants having to compete with their peers when searching for internship and employment opportunities. For instance, Wesley felt as though she was competing when it related to selecting a major and settling on a career within engineering. She most often ended up choosing whatever career path her friends and classmates around her decided to do:

First, I have to figure out what I want to do, but you don't actually pick what you want to do. You're like stuck with it. My decisions in my career goals, or my career goals changed because of people around me. So, it wasn't even necessarily me that changed my career goals. It was the people that were surrounding me. (Wesley)

Jennifer disliked the competitive aspect of career fairs that elicited her classmates to overindulge in self-promoting behaviors:

I kind of don't like career fairs and stuff because it's the suck-up phase, and who can talk the best about themselves, and stuff like that - because somebody else can talk better about themselves, or somebody has a better GPA or something. (Jennifer)

Renee relished the notion of outperforming her counterparts on projects and activities along her pathway toward a career in engineering leadership roles. However, she also questioned
whether or not she would be able to endure the pressures associated with that type of
avancement:

It's more of like I would say just kind of being top dog always. I would say it's
competitive, friendly-competitive type of environment where it's like, "Oh yeah, I want to
be boss. I want to be leader." So, each step, it's kind of getting higher and higher up the
chain. Sometimes I'm motivated to do that, but sometimes I'm like maybe I'll just be
happy. I feel like sometimes a lot of pressure to be the top female engineering dog in any
company that I work for. But sometimes I'm like I don't know if I'll be happy doing that,
you know? (Renee)

Allowing Things to Fall into Place

The last cluster of UOS associated with Understanding CGS involves the participants’
thoughts that things will simply just fall into place. The premise for this theme is based on
several participants’ admission that they had difficulty setting career goals. Wesley mentioned
on multiple occasions that she struggled in sorting out or finding out what she wanted to
do. Likewise, Renee seemed fairly uncertain when talking about goal-setting. However, despite
lacking a formal plan, she was more than eager to take advantage of career opportunities as they
were presented to her:

You asked me about goals, and that's one thing I always hate talking about or elaborating
on, because I don't know my goals. . . . But in terms of professionally, I don't know. I'm
just kind of like I'll go wherever the wind takes me, and I'll take any opportunity that I
can. I don't know what those opportunities are now, but I will when they come up.
(Renee)

Jennifer also admitted to not really setting career goals. Nevertheless, she chose to rely
on the prestige of her institution and its engineering program to assist her with her job search in
the absence of a solid career plan:

It's okay to not know what you want to do. Everything will fall into place. I know a lot of
people are like, "Oh my gosh. I don't know what to do." Me and my friend always go,
"You are an engineering student from [the university]. That's all you need. After you get
your degree you can figure out what you want to do with that. . . ." So, I'm comfortable where I am. Even though I'm lost, I don't feel completely lost. Yeah, if you really know what you're doing, hopefully, brand name can get you somewhere. And you'll figure out the rest. (Jennifer)

**Individualized Comments**

Along with the general sub-themes, a separate set of individualized sub-themes also emerged in association with *Understanding CGS*. I organized them into three groups, which entail how one participant organized her goals, how another participant valued professional connections, and how a third participant’s CGS was heavily influenced by one of her parents.

One of the individualized sub-themes associated with *Understanding CGS* involves Willow’s comments about how she organized her goals. She shared that the first thing she did was write down her goals:

Career goal setting means to me, well personally, it means for me to write it down. . . . I thought this was really silly, but I have a friend that says, "Even if you're in a room by yourself, you should just say it and put it out there for good energy. Then, you'll attract good energy." So, I do that now, and then write down my goals. (Willow)

Willow then embraced the use of an incremental or step-by-step approach to achieve her larger career goals. She explained that her plan involves creating several sub-goals in order to meet the primary objective, which ultimately will motivate her to set additional goals:

I do it like step-by-step kind of thing. I don't do it where - I want to be this in 10 years. So, I'm going to focus on those 10 years. No, I have that as my master plan, but have mini goals I want to set. . . . Basically, writing down your goals and making smaller goals to reach the large goal in the end, then continue to make goals. Even when you meet that one goal, make another goal after that. Eventually, you'll get to where you want to be. (Willow)

Another individualized sub-theme associated with *Understanding CGS* involves Jennifer’s comments about the power of having a strong professional network. She admired her
peers who had made connections in industry in order to find employment opportunities, seeing that as a trait she needed to acquire:

You have to know people, connections. I was talking to one of my friends about that recently, and she joined a sorority and something. And she was like, "Yeah, I joined the sorority because I need the network and getting certain connections, because we're not fortunate enough to have parents who already have those connections. . . ." I know one of my friends got her job last summer, or the summer that just passed, because her friend's dad works somewhere, or something like that. And that's how she got the job. . . . So, getting connections is very important. (Jennifer)

A third cluster associated with Understanding CGS involves Jane’s comments about how her parents had shaped her career goals by enlightening her of the availability of resources geared towards career counseling. Additionally, Jane’s mother also encouraged her to engage in an early career preparation process, which included setting goals and creating action plans for achieving those goals:

She had us start thinking about what we wanted to do as a career a lot earlier than most people. And then she would keep checking in on us, like, "How have your goals changed?" At 10 years old, she was like, "What is it that you want? What are the steps that you need to take?" . . . And then once we got older, she was more serious about it. Like, "Write down your goals. . . . I'll help you along the way. But you need to be prepared." (Jane)

Furthermore, Jane’s mother continued to set a strong foundation for her career planning. The regimen and preparation process she instilled in Jane was certainly a benefit to her, even several years later:

Yes, it started very early. My mom was very serious. She had us doing homework in the summer. And I hated it at the time, but now I’m glad. . . . I think she started making a resume for us when we were in fifth grade. . . . Yeah, I think it was 11th grade. We had this resume assignment, because they were assuming that nobody had a resume since we were in high school. And I was like, "Do I just pass in the one I already had?" And they were like “Umm.” Everybody else was starting from scratch, and I was already prepared. So, I just like that I had that footing, that foundation. (Jane)
What Mattered Most

When asked what mattered the most about their CGS processes, the participants’ comments all varied. Therefore, I grouped their statements into five separate UOS, one for each participant. Then I created individualized labels summarizing their concerns for each of those sub-themes. For example, Wesley was concerned with financial stability and having a comfortable lifestyle. Thus, the cluster of UOS used to describe her thoughts and feelings was labeled Financial Stability. Subsequently, Jennifer’s cluster of UOS was labeled Lack of Guidance/Parental Support, Renee’s cluster of UOS was labeled Transition into the Professional World, Willow’s cluster of UOS was labeled Reaching Goals, and Jane’s cluster of UOS was labeled Managing Adulthood.

Wesley: Financial Stability

The first cluster of UOS associated with What Mattered Most involves Wesley’s need for financial stability. She wanted to find a job that provided her with financial security rather than only allowing passion to guide her career decisions:

Because everyone's always like, “Find your passion.” I'm doing it for the money, and I'm ready to go, “Look guys!” Honestly, then, I might actually sustain myself in finding my passion. I can't sustain myself in finding my passion. You know what I'm saying? And even my friends who have graduated college, and they're not happy in their jobs, and they're like telling them to move from their jobs. But I'm like, you don't know what their financial situation is like. What if they can't move from that job because it's supporting them. You've got to have money. (Wesley)

Financial stability was a priority for her mainly because it would allow her to live a type of lifestyle that she thought was comfortable:

If they were to offer me a lot and then another company that's in a field that I really, really like or just a community that I really, really think I would feel comfortable living in. If they offered me less, but not by too much but something I could sustain myself on.
If I could sustain where I'm living, then I'm okay. I'm okay with that as long as I can live comfortably, then I'm fine with that. (Wesley)

Wesley also expressed that she really wanted to travel and would even be comfortable moving away from her family, but only if she had the financial means to do so:

I recently started to enjoy traveling and stuff like that. So that's something that I want to do like soon, not soon but like in the next few years I want to be traveling. So, I need to have means to travel. I'm not trying to move somewhere far away like California and not be able to travel because I don't have the money for it. . . . I'm totally fine moving as long as I can call my family, then I'm fine. I'm good. (Wesley)

**Jennifer: Lack of Guidance/Parental Advice**

The second cluster of UOS associated with What Mattered Most involves Jennifer’s “struggle” or journey as a first-generation college student from an African background who had to navigate her way through engineering on her own:

Definitely the struggle. If I could do this again, I would not go through this again. But since I've already been through it, definitely the struggle. Because so many people are coming in just like me, who don't have parents who have been to school. A lot of the African community or the [ethnic subgroup] community alone, most of our parents came here and were the first people to go off into school. So, it's very important to me to have been through this struggle. (Jennifer)

Jennifer realized that her experience was different from other students whose parents had attended college. She yearned for specific types of encouragement or advice from her parents to help motivate her throughout her college journey:

Because coming into school, even though some people have been before me, all I got was, "You got it. You're smart. You're going to do well." That's the kind of pep talk I got. . . . Even people whose parents have been to school, I know a lot of them are struggling now, and their parents are going to be a little bit tougher on them because they've been through this process, like, "I know it's hard, but I did it so you can do it." Sometimes it's a little bit harder, because not everybody went to school for the same thing. So, you don't necessarily understand the type of struggle I'm going through. (Jennifer)
Having struggled in these aforementioned ways caused Jennifer to want to help others and provide them with inspiration and guidance:

Struggle has allowed me to talk to other people about, "Okay, so this is what you're going to need to expect. It's going to be hard. Failing is okay, but you're going to have to build up from it." It's given me an insight that I was not given coming in. . . . So just being able to pass off my testimonies and whatever I've been through to other people. . . . If teachers made enough money, I'd definitely be a teacher because . . . I love passing on what I've learned through my experience. (Jennifer)

**Renee: Transition into the Professional World**

The third cluster of UOS associated with *What Mattered Most* involves Renee’s efforts to conclude her educational career while also transitioning into her professional career simultaneously. Initially, she was caught up in the excitement of college graduation and was reveling in that moment:

Right now, what I'm looking forward to most, towards the end of my college career, is honestly just graduating. Like taking my cap and gown pics and just that last few weeks of school, where there's this hype to, “I'm finally graduating,” All my friends and family are coming to town, and it's going to be a very exciting time. I'm really looking forward to that. (Renee)

On the other hand, Renee expressed having anxieties related to her new developmental stage, which entailed starting a new job and living in a state with a social climate that she thought was questionable:

I'll be in [southern state]. I'm not particularly happy about living in [southern state]. We kind of talked about this in class today, too. Just the state in general. I think it's a very weird and backwards state and has a lot of work to do. But just kind of opening the next chapter. I don't know what that's going to look like. I mean, I know where I'm going to be and what I'm going to be doing, but I don't know. (Renee)

**Willow: Reaching Goals**
The fourth cluster of UOS associated with *What Mattered Most* involves Willow’s exact plans to set and accomplish her career goals. She was fairly succinct about her intentions to achieving her goals, remaining focused, and keeping a positive frame of mind:

What matters to me most is that I reach most of them [goals]. . . . Because if I'm not reaching most of my goals, that means I'm distracted, or I'm getting off on some type of path that I didn't plan to get on, or that maybe my mindset has changed. Maybe I'm going through something that's making my mindset so negative. . . . Then, at that point, you need to backtrack and see where that negativity came from, and how you need to deal with that to change that. So, negativity is not as resulting from whatever caused it again. . . . Yeah. So, I guess what matters to me the most is [that] I'm reaching most of my goals that I set for myself. Oh! And that I'm not letting anyone or anything interfere with that. . . . Yeah, I pretty much always do achieve my goal. (Willow)

**Jane: Managing Adulthood**

The fifth cluster of UOS associated with *What Mattered Most* involves Jane’s realization that her capabilities and confidence improved throughout her CGS process. For instance, she had developed several professional competencies simply by participating with internships and research opportunities:

Yeah, I guess the thing that this whole process has taught me is that I'm a lot more capable of doing things than I thought. Really, all the experiences I've had since I've been in college with my internship and with research, these are things that I never thought I was going to be able to do on my own. And so, just going through [the] process and realizing my abilities are greater than I realized. (Jane)

As a result of gaining experience at an internship, Jane’s confidence in professional settings also increased, which positively shaped her CGS process as well:

My boss at my internship, at the end of the internship, she has to give a review of my work. And she's like, "Going through this six-month process, I can just see in you how much confidence you gained from the beginning to the end." So, I guess confidence is something that I've been able to gain from the experience. (Jane)
Another area of development for Jane involved her learning how to manage stress and establishing a threshold for work-life balance:

Handling stress and time management also, even though that's a process that is ongoing. I guess realizing how much, knowing what my boundaries are as far as how much I can do and being like, "Okay, this is what I'm willing to do. And I know if I go past this, I'm going to over-stress myself." So, learning what I can and can't take on. (Jane)

Jane also wanted to learn how to make better decisions as an adult, especially those pertaining to her relationships with various people in her life:

Learning what I like and dislike. Learning about how to handle adult relationships. College has taught me a lot. Adult relationships when it comes to dealing with professors, and my friends, and my boyfriend, and stuff like that. College in general, I guess, has taught me how to be an adult more - think on my own, who I want to be as a person, and what values I hold dear to me. (Jane)

**Social Contexts**

Several of the participants’ responses from both of the interviews were related to social contexts, which include comments they made about disparities, challenges, or issues that directly referred to their race and/or gender. As a result, I clustered those UOS into six groups and labeled them as *Explicit Themes*. These themes are comprised of the participants’ comments regarding cultural influences from their families and ethnic communities, their thoughts about marriage or starting a family, their need for peer support, their use of the minority engineering programs (MEP) office, their interactions with mentors, and their involvement in a living-learning community (LLC).

Along with the *Explicit Themes*, several of the participants’ responses regarding social contexts also include comments they made that either alluded to or indirectly referred to their gender, race/ethnicity, or their status as a minority in general. I then clustered those UOS into three additional groups and labeled them *Implicit Themes*. Next, after creating *Explicit Themes*
and *Implicit Themes*, I added another group of UOS based on the participants’ individualized responses to the question about what types of advice they might offer other Black women who hoped to follow in their footsteps as engineering majors, which I labeled *Advice to Other BWEMs*. Together, these three themes make up the *Social Contexts* category. A representation of the explication process for this category is illustrated in Figure 5.

<table>
<thead>
<tr>
<th>Category</th>
<th>Themes</th>
<th>Units of Significance</th>
<th>Participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Contexts</td>
<td>Explicit Themes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Familial/Cultural Influences</td>
<td>Wesley: ●, Jennifer: ●, Renee: ●, Willow: ●, Jane: ●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marriage or Starting a Family</td>
<td>Wesley: ●, Jennifer: ●, Willow: ●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Need for Peer Support</td>
<td>Wesley: ●, Jennifer: ●, Renee: ●, Willow: ●, Jane: ●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interactions with Mentors</td>
<td>Wesley: ●, Jennifer: ●, Renee: ●, Willow: ●, Jane: ●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LLC Involvement</td>
<td>Wesley: ●, Jennifer: ●, Willow: ●, Jane: ●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Implicit Themes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identifying as a Woman</td>
<td>Wesley: ●, Jennifer: ●, Jane: ●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identifying as Black/African American</td>
<td>Wesley: ●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Identifying as a Minority in General</td>
<td>Wesley: ●, Jane: ●</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MEP Office</td>
<td>Wesley: ●, Jane: ●</td>
<td></td>
</tr>
<tr>
<td>Advice to Other BWEMs</td>
<td>All sub-themes were individualized.</td>
<td>Wesley: ●, Jennifer: ●, Renee: ●, Willow: ●, Jane: ●</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 5.** Category: *Social Contexts* with emergent themes and sub-themes.

**Explicit Themes**
In categorizing the participants’ explicit remarks related to their social contexts, I grouped them into five clusters of UOS consisting of familial/cultural influences, marriage or starting a family, need for peer support, interaction with mentors, and LLC involvement. Two of these sub-themes include combined labels meant to represent a range of responses. For instance, familial/community influence consists of the participants’ comments about their parents or relatives, as well as other members of their ethnic subgroup within the larger African community. Also, marriage or starting a family consists of the participants’ comments where they mentioned the possibility of either getting married or having children later on.

Each of the explicit themes include comments from at least two or more participants. However, Wesley was the only one who did not make any comments that might have implied how social contexts played a role in her CGS process.

**Familial/Cultural Influences**

The first cluster of UOS that is categorized as *Explicit Themes* in relation to the participants’ social contexts involves their comments associated with the cultural influences placed on their CGS processes by the members of their family and community. Jennifer and Jane were the most vocal about sharing these types of experiences. Jennifer explained that she initially received information about careers from her ethnic community who encouraged the young men to pursue careers in technical fields and the young women to pursue careers in health care:

> In a lot of African communities - I can speak for [ethnic subgroup] because that's what I am, but they go into the health field and more of the guys will go into engineering or computer science. So, I guess it was a little bit different but they've heard of engineering and they know that is a pretty successful career. So, it was a little bit different for them but because they knew it was something that I could get success off of, it wasn't that big of a deal. (Jennifer)
In addition, Jennifer talked about her experiences as a first-generation college student and a member of an African community, as well as how she struggled to overcome the disadvantages associated with her identity in belonging to both of those minority groups:

Because so many people are coming in just like me, who don't have parents who have been to school. A lot of the African community or the [ethnic subgroup] community alone, most of our parents came here and we’re the first people to go off into school. So, it's very important to me to have been through this struggle. (Jennifer)

Jane was also of African heritage and heavily influenced by her ethnic subgroup. Her family instilled the values of education and hard work into her with the intentions of helping advance their family’s legacy:

My grandparents are from Africa, and they came over here when they were like 18. So, they were just kind of trying to live the American dream as far as like working hard. Not necessarily like having a career, it was more about getting on your own two feet. . . . Whereas, my mom was like just having an education was kind of like something that was being deemed as important back when she was a kid, so like in the '70s, '80s. And so, she always encouraged me and my sister to do really well in school. They were very hard on us because. . . this goes across the board for a lot of Black people, but their parents usually tell them that they have to work twice as hard as everybody else. (Jane)

Marriage or Starting a Family

The second cluster of UOS that is categorized as Explicit Themes in relation to the participants’ social contexts involves their comments associated with getting married or starting a family. Jennifer and Renee both talked about their potential plans to establish a family life. Jennifer described marriage as a developmental milestone that she believed most women hope to achieve by a specific age, but she preferred not to place a deadline on when that event needed to occur for her. Instead, she interpreted marriage as a measure of success to be accomplished over time, much like earning a higher salary:
I'm the type of person who, I don't really like to put an age to a certain goal or something, because I know a lot of females they put marriage to a certain age and then get disappointed, like "Oh my gosh, my life is about to end," kind of thing. Usually I don't put an age to a certain kind of thing, but of course, I see myself in the future as being successful. Successful in terms of money, monetary value. . . . I feel like I'm going to live with my mom until I move out and get married or something. (Jennifer)

Renee was more elaborate in her thoughts about finding a balance between family and career. Although she was excited to be making plans for a successful career in engineering, she was also interested in having children and someday starting a family. After considering the pros and cons of both endeavors, Renee realized how difficult it might actually be to accomplish them simultaneously. She then reflected on her experience with her mother, and decided to use her as a template for what her next steps could be en route to becoming a successful working mom:

I'm finding a hard time to find love and start a family because of my career success or being top dog at a company or something like that. I want the success but I also want to start a family and everything. If you would have asked me five or six years ago if I want to be a stay-at-home mom or something like that, I would have said absolutely not. That sounds like an awful job. But you ask me now, I'm like, that's actually not a bad deal. . . . But when I think about it, if I am starting my career and I have kids down the line, I actually am gravitating towards being part-time or a stay-at-home mom for a while. So, my struggle is career and family because as a woman, it's very hard to do both. And I'm [not] saying that it's impossible, but maybe at some point throughout your life when you have both career and family, something is going to lag behind before you're able to find that balance and mesh well together. And from my experience with my mom, she was always at work. She was not a stay-at-home mom at all. I think that's also where I get it from, like always got to be working hard for the family and making sure everything's straight but also being a nurturing mom. But I've never had the stay-at-home mom experience. (Renee)

Need for Peer Support

The third cluster of UOS that is categorized as Explicit Themes in relation to the participants’ social contexts involves their comments associated with needing support from their peers. Jennifer, Willow, and Jane all relied on classmates within their majors to provide them with a sense of both social support and academic support, especially students with whom they
shared the same racial and ethnic background. For instance, Willow used her African American peers as a sounding board whenever she needed to make difficult choices regarding her academics. She said, “I realized that actually talking it out with other people and [Black woman graduate student], and having those meetings was really helpful. Actually, voicing what you're going through actually helps you make decisions.”

For Jane, she noticed that there were few African Americans in her major. So, she began socializing with other minorities as a way to cope with those disparities, and her classmates ultimately became her friends. Jane believed that she developed close ties with her peers due to the low numbers of Black students at her institution and in her academic program:

Well, I mean, another reason that we all met is we're in the same major, and so I guess that does kind of go with it. In my major it's very like, there's not a lot of minorities, period. So, we all hang out together. So, that's probably part of the reason why we're closer. I'd say just being in the same major and just going to the same class was kind of like really meeting each other. . . . And then just having a support system at [the university] has been important, especially as a Black student in a mostly White school. Having groups like NSBE and the [MEP] office and stuff like that has really helped me realize that I'm not alone. . . . And then just having friends that are going through the same thing that also helps. (Jane)

Similarly, Jennifer struggled to find Black friends in engineering as well. She even discussed the closeness of African Americans within each class of engineering students. Jennifer also mentioned how difficult her transition into engineering was because of the lack of other Black students that were available for her to connect with:

There's not a lot of Black people here, in general. But then a lot of the Black people who do come here are not in engineering. So, that makes it a little bit more difficult. And then coming in my class, we did not have a lot of engineers. But the class after, they came in very tight knit, and they had a lot of engineers. I guess it would have been a little easier for them to stick together. Whereas, for me - when I was on the fence - when I was like, "Should I leave or not," it would have been more easier [sic] for me to fall off because I didn't have any Black engineering friends, or I didn't come in with anybody who was an engineer. (Jennifer)
On a similar note, Renee referred to the paucity of African Americans in engineering, and more specifically Black women. She also implied that the lack of representation of same-race/same-gender peers served as a motivator for her to pursue a career in engineering:

The concept of being a minority in engineering drew me to it. I like being, I wouldn't say doing something rare, but being special? I don't know. But not a lot of black women are in engineering. Okay, I want to be in engineering then. (Renee)

*Interactions with Mentors*

The fifth cluster of UOS that is categorized as *Explicit Themes* in relation to the participants’ social contexts involves their comments associated with having mentors. Willow, Jane, and Renee each mentioned how mentors helped guide them throughout their CGS processes. For instance, by participating in a summer transition program, Willow met a Black woman graduate student who encouraged her to join an academic support group with other minority students in her major. As a mentee and participant in the support group, Willow gained access to information about core engineering courses and was enlightened of professional development opportunities that were of interest to her:

I think it was right after I participated in [engineering summer transition program], it was the summer right after my freshman year. That's where I met [Black woman graduate student]. But, people like her - Obviously, I don't think I would have joined [minority engineering academic support group] if it weren't for [engineering summer transition program] and knowing her, because I would have been like, "What the heck is [minority engineering academic support group]?" (Willow)

Jane was also mentored by the same Black woman graduate student. In addition, she received guidance from a senior Black woman senior faculty member as well. Both individuals played an integral role in ensuring that Jane was successful as an engineering student and was on track toward achieving her career goals:
And I've always had people like [Black woman graduate student] and [Black woman senior faculty member] that if I need help or the resources to help me in something, they always know where to go to. Or if they don't know, they'll find it for me. They actually care about me, which is really important to me. (Jane)

Renee preferred to expand her network beyond just involving faculty, administrators, and graduate students. She was interested in learning from individuals who could help her apply her academic experiences to the professional world. Renee was focused on, “Getting mentors and talking to professionals in the industry and people who have gone through the engineering program here at [the university] or other schools.”

Living-learning Community Involvement

The sixth cluster of UOS that is categorized as Explicit Themes in relation to the participants’ social contexts involves their comments associated with being involved in an LLC. Renee and Willow indicated that they had participated in an engineering LLC for women, which was a tremendous benefit in helping them achieve their career goals. For Renee, being involved in a residential community of her peers provided her with a network that she hoped to utilize throughout college and beyond. She described the LLC as a competitive but supportive environment of women with ambitions of being successful in the STEM workforce someday:

And then when I got to [the university], especially when you go to [engineering LLC for women], I find that a lot of the friends that I have now or colleagues, classmates - we all have the same jobs. We're kind of in this circle. And because we have the same drive and motivation to be successful women in the STEM field. I feel like that started with [engineering LLC for women]. Because we're all women but we're also competitive and really smart. We want to go somewhere. I think it kind of started there. (Renee)

Willow’s comments related to an LLC focused less on her interactions with her peers in the community and more on returns as a result of her affiliation with the community. As a participant in the engineering LLC for women, she gained access to numerous engineering
companies that had partnerships with her engineering program. Willow was determined to be
hired for an internship at a particular engineering company, which she achieved through her LLC
involvement and after multiple attempts:

The first time I applied, no one looked at me. [I] didn't get it. Then, the second time, I got
accepted into their diversity program. It was for a weekend, and I went with a few other
people in [the engineering LLC for women]. [I] got accepted to that. Then, within that
weekend, that conference, I got an interview to work with them for an internship. And
then, I got that internship, and I was really, really excited. I came back and [told]
everyone, "See, I told you I was going to work at [premiere engineering company]!"
(Willow)

Implicit Themes

Along with the clusters of UOS that explicitly related to the participants’ social contexts,
a group of implicit themes emerged as well. As a result, I created four additional groups of UOS,
which include comments where the participants made indirect references to their respective
identities as a woman, as a Black or African American, and as a minority in general, as well as
any comments they made about the MEP office that provided support for engineering students
with those same identities. In addition to these sub-themes, I created a fifth group of UOS that
consisted of the participants responses to the interview question soliciting their suggestions for
aspiring BWEMs who looked to follow in their footsteps. I labeled this group Advice to Other
BWEMs; and despite its description, the participants’ comments regarding race/ethnicity and
gender were never directly mentioned. Together, these sub-themes make up the Implicit Themes
category.

Identifying as a Woman

The first cluster of UOS that is categorized as Implicit Themes in relation to the
participants’ social contexts involves their comments associated with identifying as a woman.
Renee and Willow alluded that several of their experiences throughout their CGS processes were
influenced as a result of their gender. For instance, Renee referred to her involvement in an engineering LLC for women throughout each of her interviews. She talked about how she and the other participants shared the same values and career goals. Renee also explained that they were gaining work experiences from the same engineering companies that were committed to increasing opportunities for women in STEM:

But then I've noticed, there's three or four of us in particular who started [prominent engineering company], that was where my first co-op was, and we've gone to very similar jobs and it has always been the same similar group in terms of activities on campus and being within a [MEP office] program and also our jobs. So, a lot of us have worked for [engineering company #1] and also for [engineering company #2]. And we're also just not the same people. We just have similar values when it comes to working in the STEM field. (Renee)

As I mention in the sub-themes related to the participants’ Past Lives and their knowledge about engineering, Willow had stereotyped engineering as a men-only profession that consisted mostly of auto-mechanics. She implied that she initially chose not to consider engineering at the time because of her socially constructed beliefs about which careers were most appropriate based on her gender. Again, Willow recalled, “When people said engineering, I always said, ‘No, I'm not a man. I don't want to be an Engineer. I don't want to work under cars and stuff.’"

Identifying as Black/African American

The second cluster of UOS that is categorized as Implicit Themes in relation to the participants’ social contexts involves their comments associated with identifying as Black or African American. Most of the participants were fairly explicit when speaking about how their racial/ethnic identities influenced their CGS processes, especially as it pertained to their need for peer support during their adjustment as incoming engineering students. However, Renee also expressed that she was facing a dilemma by accepting an employment offer with a prominent
engineering company located in the south, specifically because of her race. As I denoted previously in her individualized sub-theme labeled *Transition into the Professional World* related to the category of *What Mattered Most*, Renee mentioned that she was extremely apprehensive about moving to a southern state with an unfavorable reputation of their mistreatment of African Americans. Again, she stated:

I'll be in [southern state]. I'm not particularly happy about living in [southern state]. We kind of talked about this in class today, too. Just the state in general. I think it's a very weird and backwards state and has a lot of work to do. But just kind of opening the next chapter, I don't know what that's going to look like. I mean, I know where I'm going to be and what I'm going to be doing, but I don't know. (Renee)

**Identifying as a Minority in General**

The third cluster of UOS that is categorized as *Implicit Themes* in relation to the participants’ social contexts involves their comments associated with identifying as a minority in general. Jennifer and Renee alluded that several of their experiences throughout their CGS processes were influenced as a result of belonging to a minority group. As I mention in one of the individualized sub-themes related to *Understanding CGS*, Jennifer implied that by being an ethnic minority and a first-generation college student, she lacked the social capital or professional connections necessary for securing employment successfully:

You have to know people, connections. I was talking to one of my friends about that recently, and she joined a sorority and something. And she was like, "Yeah, I joined the sorority because I need the network, and getting certain connections because we're not fortunate enough to have parents who already have those connections." (Jennifer)

When asked what she saw herself doing in the next five years, Renee believed that she would be employed at a reputable engineering company working with their minority resource groups (MRGs). She also listed the different types of groups they featured:
So, five years? I can honestly see myself just working with a full-time job, but I'll most likely be with [prominent engineering company]. I don't know what my position will be. Who knows? I'll probably be involved with their [company] resource groups, which is like their minority groups - Hispanic, and their Black group. They actually have all kinds - veterans, LGBTQ, all of that. (Renee)

Minority Engineering Programs Office

The fourth cluster of UOS that is categorized as Implicit Themes in relation to the participants’ social contexts involves their comments associated with their use of the MEP office and the types of support they received from the staff who worked there. Renee and Willow specifically mentioned interacting with individuals and groups that were either employed or promoted through the MEP office. When reflecting on how the office helped shape her CGS process, Renee shared that, “In terms of people and organizations that influenced me, I would say definitely [the MEP office] and the people I've met through [the MEP office].”

Willow was also positively influenced by administrators and graduate students in the MEP office. She talked about how they always made themselves accessible to her, regardless of her needs. Willow noted that the MEP staff aided in her leadership development in addition to providing her with career counseling:

The [MEP office] has helped me so much. I don't think I'd be here without it. I definitely would have dropped out of engineering by now because I think working with [the MEP office], no matter what leadership position you're in, or even if you're not in one, they always make an effort to be available. There's always someone walking around saying, "If you need me, I'm in this office. If you want to talk, here's my email. We can talk about this. If you have any questions, or you're not sure about career goals, you can talk to me about this." (Willow)

As illustrated by several of the sub-themes associated with Implicit Themes, the participants encountered a plethora of experiences due to their identities as African Americans, as women, and as minorities in engineering. Despite enduring certain challenges, they were
fortunate enough to have access to campus resources such as the MEP office, which provided support for students from similar underrepresented backgrounds. Therefore, in an attempt to build on those respective experiences regarding their intersecting identities, I asked the participants to also provide a few words of wisdom for other aspiring Black women who hoped to someday major in engineering.

**Advice to Other BWEMs**

At the end of the second interview, the participants were asked what advice they could give to other BWEMs who were looking to follow in their footsteps. The sheer nature of this question was pertinent to their social contexts because it alluded to how they might help their peers in engineering who identify as members of their same intersecting racial/ethnic and gender groups. The participants all responded in an individualized manner. Therefore, I clustered their comments accordingly.

Despite the individualization of the participants’ remarks, two underlying sub-themes also emerged. One sub-theme includes the participants’ suggestions for BWEMs to make connections with or seek help from others, and another sub-theme includes their suggestions for BWEMs to remain resilient throughout their CGS processes.

**Making Connections and Seeking Help**

The first sub-theme associated with Advice to Other BWEMs consists of the participants’ comments urging their fellow BWEMs to reach out to other people as a means of establishing support networks and asking for help. For instance, Wesley’s advice focused on finding mentors who might encourage BWEMs to improve their work ethic, Renee emphasized finding a sense of community as well as one’s own sense of self, and Willow suggested that BWEMs seek advice from older students and employees who work in the MEP office.
Wesley: Mentors and work ethic. The first cluster of UOS associated with Advice to Other BWEMs involves Wesley’s comments about mentors and work ethic. She suggested that BWEMs should find individuals who can challenge and support them throughout their journey as engineering majors. Wesley emphasized the need for having someone who could provide them with direction as well as helping them establish strong habits towards successfully achieving their career goals:

I think having a mentor that I would have had to meet with, I think that definitely would have helped. I feel like they push you in the right direction earlier on and so you get in those habits of like, better habits than I got in to. That probably like pushes you to find, not necessarily find your passion, but at least knock some work that you don't want off the list. . . . So, I'd say get help before you need it. I would also say reach out definitely. Build connections with people, everyone, as many people as you can, really. Because it helps, you know. (Wesley)

Renee: Finding community/oneself. The second cluster of UOS associated with Advice to Other BWEMs involves Renee’s comments about finding one’s community, friends, and oneself. She shared her perspective as a Black woman at a PWI and the specific steps she took to establish her own community of support. Renee reflected on her development in transitioning from high school to college, and encouraged BWEMs to focus on their overall personal growth in trying to find their community:

I always say find your community, always, always, always. When you're a Black female in general going to a predominantly White institute, it's so hard to find your community or just finding your group of friends. . . . I came from a predominantly White area. My school was like 75% White. So, it wasn't that much change in terms of demographics of school. But I started to find myself being gravitated more towards people who look and thought and acted like me. It was also finding me and myself and my own culture, which I didn't really have or was exposed to in high school. . . . So, focusing on being yourself and finding yourself as well. You may think you know yourself coming into college, but you'll realize by the time you graduate, you've gone through several challenges and steps, mentally. . . . And making those connections and group of friends that will support you and advocate for you, through any and every situation. (Renee)
Willow: Asking for help/seeking advice. The third cluster of UOS associated with Advice to Other BWEMs involves Willow’s comments about asking for help and seeking advice from others. Having encountered academic difficulties during her freshman year, Willow sought assistance from the MEP office. After which, she was able to learn from the experiences of others who had taken similar paths in engineering. As a result, Willow was comforted in knowing that there were people to help her if she needed it:

I’d say don’t be afraid to reach out to people, and ask for advice, and to get help. Freshman year, I was afraid to ask for help, or to reach out to people, or mentors because I thought that everyone was getting straight A’s. I thought everyone was doing so well, and that I was the only one who needed help. Then, [the MEP office] definitely teaches you that you’re not the only one. . . . Don’t think that you have to make a decision alone. There are a lot of people that have been in your shoes, and that have already gone through what you’re going through. So, they know best. They’ll speak out of experience for what you’re going through, and how to guide you. (Willow)

Remaining Resilient

The second sub-theme associated with Advice to Other BWEMs consists of the participants’ comments encouraging their fellow BWEMs to persevere throughout their journeys in engineering. For instance, Jennifer urged them to push through despite their failures and to share those stories as a source of motivation for others. Whereas, Jane advised BWEMs not to worry about having to change plans and to take advantage of campus resources like the career services office to help them achieve their goals.

Jennifer: Pushing through and sharing stories. The fourth cluster of UOS associated with Advice to Other BWEMs involves Jennifer’s comments about pushing through and sharing one’s stories. She urged students not to quit despite the initial failures they encounter. Reflecting on the challenges she faced throughout her experience as an engineering major, Jennifer believed that BWEMs should share their stories with one another as a source of
motivation. She also mentioned an instance during her first year when her mother offered her a few words of encouragement:

You're going to fail a few times, but don't let that determine who you are, and be who you are. . . . Don't be embarrassed. So, allow your story to motivate others. And allow your story to encourage others to be the best possible self that you could be. . . . But don't quit just because it's hard at the moment. . . . Push through it. My mom always used to say freshman year, when I used to call her crying, "You're in this position because you deserve to be here. Other people have been through the same thing as you and are going through the same thing as you. And if they can do it, you definitely can. Stick with it." (Jennifer)

**Jane: Changing plans and utilizing resources.** The fifth cluster of UOS associated with *Advice to Other BWEMs* involves Jane’s comments. Unlike the other participants, she chose not to make any inferences about her social contexts when offering advice to other BWEMs. Instead, Jane encouraged them to not be afraid of experiencing a change of plans and for them to utilize campus resources such as the career services office when attempting to achieve their goals. However, her advice did share similarities with the underlying themes of suggesting that BWEMs exhibit resilience and seek out individuals who could provide them with guidance:

As I said before, basically knowing your resources. Most universities you go to, . . . really anything that you need career wise, somebody can help you. . . . So, I went to the career services office and I was like, "This is what I want to do work in." And I was like, "I want to be a biomedical engineer. I really need experience. Do you have any companies that are affiliated with [the university] that I might be able to reach out to?" They gave me a list of companies. . . . And a lot of times, the career services people might know about opportunities before it gets out to everybody else. And so, you have a leg up. (Jane)

In summary, there are a few details about the findings in this chapter that need to be acknowledged. For instance, one of them in particular involves two subject areas that encompass several of the most salient themes and sub-themes: the participants’ comments regarding their
interactions with specific people, and the participants’ comments regarding the specific steps they took throughout their CGS processes. The first subject area consists of the participants’ remarks about their experiences as or becoming engineering majors where they mentioned how much they relied on their family members and mentors for guidance and support to help them make it through. They also sought assistance from their same-race or same-gender peers, often using them as sounding boards to help them make decisions or as friendly competitors to help motivate themselves toward achieving their career goals.

The second subject area consists of the participants’ remarks about the specific steps they took in order to pursue their career goals. They discussed a number of tasks that successfully helped them become engineering majors as well as navigating their respective pathways through engineering. Furthermore, the participants felt compelled to engage in various activities such as educating themselves about engineering prior to college, exploring the different majors within engineering as first-year students, identifying coping strategies to help them manage the academic stress associated with their major, and figuring out which engineering fields best suited their career interests.

Another notable detail involves the particular format I used to present the findings for Chapter Four. As I mentioned previously, Lee and Oyserman’s (2009) individual and contextual factors provided the structure for organizing the participants’ comments in this chapter, which includes their responses to the interview questions about their past experiences as well as their developmental and social contexts. Therefore, the findings reveal statements made by the participants about their lives leading up to the time of the interviews rather than who they envisioned they might become in the future. Chapter Five provides greater insights regarding
how each participant actually constructs their possible selves, focusing specifically on the three schema of hoped-for, expected, and avoided selves.

One last detail worth mentioning involves the number of common themes and sub-themes found throughout the findings in Chapter Four, as the most of the participants’ thoughts and feelings were generalized across their past and present experiences. However, a few of their comments in the chapter were individualized, particularly UOS clusters associated with the theme of What Mattered Most from the Developmental Contexts category and UOS clusters associated with the theme of Advice to Other BWEMs from the Social Contexts category. On the contrary, Chapter Five focuses entirely on the participants’ comments in response to the interview questions about possible selves, and by design, is meant to examine their CGS processes from individualized points of view. As a result, the findings in that chapter feature themes and sub-themes that include each participant’s comments that are more specific to their own career interests as well as future plans for their personal lives.
Chapter Five

Individualized Clusters

As I stated in Chapter Five, I organized the findings by dividing the participants’ responses to the interview questions into four sub-lists. Again, the previous chapter features the first three sub-lists that consist of the participants’ remarks about their past experiences, developmental contexts, and social contexts. However, Chapter Five focuses specifically on the fourth sub-list, which is a compilation of responses from the three questions related to possible selves. Because all of the participants responded to those questions in a fairly unique fashion from one another, I generically labeled this category as Individualized Clusters.

The fourth sub-list consists of the participants’ individualized responses to a series of questions associated with possible selves. The questions focused on who they imagined they would become in the future, in three iterations. I asked the first iteration of these questions at the end of the first interview; I asked the second iteration at the beginning of the second interview; and I asked the third iteration at the end of the second interview. I created three separate diagrams to illustrate the explication process for the category of Individualized Clusters. A representation of the First Iteration and emergent themes and sub-themes is shown in Figure 6.
The First Iteration

Prior to concluding the first interview, I referred to the projection exercise that required participants to read a paragraph about possible selves (Appendix E). After asking them who they expected to become in the next five years, the participants’ responses primarily focused on their thoughts and feelings about how they planned to achieve their life goals. Based on their comments from the first iteration, two general themes emerged. The first theme involves the participants’ professional goals, and the second theme involves the participants’ personal goals. I also want to point out regarding these two themes that I use some of the participants’ statements interchangeably to illustrate their thoughts and feelings as they relate to both types of goals.

Professional Goals
The first theme associated with the participants’ responses to the first iteration of possible selves involves their professional goals. I clustered those statements into five sub-themes. They include the participants’ comments about career success, deciding what to do, happiness or satisfaction, graduate school, and work tasks or projects.

**Career Success**

The first cluster of UOS associated with possible selves and *Professional Goals* involve the participants’ comments about career success. Wesley, Renee, and Willow each described what a successful work-self would look like for them in the future tense. For instance, Wesley conceptualized several versions of possible selves for herself, one of which was “The Motivated Me.” This entailed her becoming a biomedical engineer and potentially securing research opportunities that would help her achieve that goal:

> So, that's a version of myself where I do get into biomedical. Because I'm still working on it. Trying to get into the biomedical field and stuff like that. I'm still trying to get research. I might not get the minor that I'm working towards. But like, I'm still trying to get into at least research. If I'm able to get into research, I think that I might be able to get a job in biomedical. (Wesley)

Renee also thought about multiple versions of herself in possible selves. She envisioned achieving success as a single woman, achieving success while having a family, as well as starting a family first and coming back to pursue an engineering career later:

> I feel like I have three different selves. . . . Being single and super successful; being super successful and also having a family, but we're seeing a lot of challenges with balancing that; or still having my career, and maybe putting it on hold for a little while to take care of my family and coming back. (Renee)

A varying reality emerged for Renee in relation to *Professionals Goals* and *Career Success*. She expressed having anxieties around being a successful Black woman in STEM and
the stereotypes associated with that. Renee also struggled with the notion of having a family along with establishing and maintaining a successful career in engineering:

So, it's either the super successful Black woman in the STEM field but single, and can't get into a relationship and start a family, which is a fear. And I find that my friends who are also successful Black women in the STEM field, that also has to do with the culture, the Black culture. Also just being a successful woman in general. Being, I guess it's perceived as intimidating and being fiercely independent. And then, finding someone that doesn't scare people away just because of the motivation and not aggressive, just building a career just like any other person. You wouldn't question that in a man. Especially because the social norms of women in society. And I think they're changing, but I find this also in social media, and TV shows, and movies. It's always the single, successful Black woman. (Renee)

Willow’s future work-self involved her being employed in leadership roles within engineering. She also saw herself working on nationwide civil engineering projects as well:

I see myself being a manager for engineers in the long haul. Well, not in the long haul, but later in life. Basically, in a leadership position. . . . So, that's what I want to be able to do - just drive down the street, or go to a different state and be like, "Yeah, I had a hand in that." Or "I was project manager for that project, for that bridge." That's what I see myself doing in the future. (Willow)

**Deciding What to Do**

The second cluster of UOS associated with PS and Professional Goals involves the participants’ comments about deciding what they wanted to do ultimately as professional engineers. Wesley, Jennifer, and Jane were uncertain in terms of which types of engineering jobs they preferred.

One of Wesley’s goals was to pursue her career interests in biomedical engineering. She explained, “If I'm able to get into research, I think that I might be able to get a job in biomedical.” Even though she was exploring various opportunities related to biomedical engineering, Wesley was unsure about whether or not she actually would enjoy that career path. She added, “If I end up liking it because that's the other thing, I don't know if I like it.”
Jennifer was also undecided about what she wanted to do in engineering. Despite nearing graduation, she struggled to find out in what ways she might apply her engineering degree toward her professional career:

I don't know what I want to be. . . . Even the major I'm in now, I don't even know how I'm supposed to apply to my life. I've been here four years, and I don't know what I'm supposed to do with this major. (Jennifer)

Jane entertained several options in deciding what she wanted to do in engineering. She mentioned wanting to enroll in graduate school, and maybe establishing a business of her own someday. However, Jane was still unsure about what her accomplishments would be in the next five years:

I guess, I'll either be completed with grad school or I mean I might go on to get my doctorate. I'm not sure yet. . . . I mean, I do have a dream of starting my own business. I'm just not sure what it is I want to do yet. I know that I don't know if I necessarily want to be at somebody else's company for the rest of my life. . . . And yeah, I guess in five years, I mean who knows? Who knows where I'll be in five years? (Jane)

Unlike the other participants, Willow seemed to know specifically which fields she wanted to pursue. She also planned to enroll in graduate school someday in hopes of earning a dual degree in business and engineering that would prepare her for future management roles:

I either want to do infrastructure. Either way, I still want to get my MBA, but there's a specific MBA I want. It's a dual program at [the state flagship], and it's a business and engineering - like MBA for engineers. So, it teaches you how to be in a managerial position for engineering. (Willow)

Based on the participants’ comments associated with Deciding What to Do, two sets of varying realities emerged. These sub-themes involve career specialties the participants were interested in and their thoughts about settling or getting stuck.
The first set of varying realities includes statements from Jane, Wesley, and Jennifer in regards to what fields of engineering they considered specializing in. For instance, Jane planned to specialize in some sort of biomedical research field while working in industry. She elaborated that her ideal work destinations included, “maybe with either like a pharmaceutical company, or maybe like a national research lab, or like a biomedical engineering firm.” Wesley also mentioned that she hoped to become a biomedical engineer as well:

The “Motivated Me” - So, that's a version of myself where I do get into biomedical. Because I'm still working on it. Trying to get into the biomedical field and stuff like that. . . . The “Late-Bloomer,” which is like, I get into a field, or I get to do what I want to do, eventually. I leave the job at [prominent engineering company]. I find a job in biomedical. And I'm like, "Oh, yes!” (Wesley)

On the contrary, Jennifer seemed lackluster about majoring in industrial and systems engineering. As a result, she was still undecided and rather disinterested with finding employment in that field:

I see stuff that I don't want to do, but I don't know if this is the major for me. I guess our major is mostly focused on manufacturing and supply chain. And no, I don't want to be in the middle of nowhere. And no, I don't want to be doing the same thing forever. (Jennifer)

Another set of varying realities associated with Deciding What to Do involves the participants’ apprehensions about settling or getting stuck during their careers. Wesley, Jennifer, and Renee each expressed their concerns if they encountered an alternative career path, and contemplated how these circumstances might affect their career trajectories.

Again, Wesley had several versions of her possible selves, which included a “Settling Me.” She described this future work-self as more of a satisfactory rather than an ideal career goal achievement. Wesley also admitted that as long as she was working in engineering and financially stable, then she would consider herself comfortable:
There's also the “Settling Me.” Which is me just going into a random field. . . . The first internship I got was [prominent engineering company], and I haven't moved on from [prominent engineering company] yet. I haven't gotten into another company or anything like that. I haven't done research or anything like that, and I even applied for a rotational program with them. I'm fine just sticking to them because I'm like "You're my last resort." Not in a mean way. I didn't dislike them. They don't have the kind of biomedical that I want to do. . . . You know, it's okay. I can live my life. I mean, I'm comfortable. I'm making enough money to support myself and my family and stuff like that. . . . That's the “Settling Me.” I'm not happy, necessarily, but it's getting the job done kind of thing. And I'm the person who's fine with kind of just coasting, and not being satisfied with how things are. (Wesley)

Jennifer’s concerns involved her thoughts about remaining in the same type of occupation throughout her entire career. She was interested in opportunities that could potentially allow her to acquire new skills and advance within an engineering company:

I don't want to be doing the same thing forever. . . . And I could see that I would be able to build in the company, grow in the company. I won't be stagnant in what I'm doing, but I don't know if I want to be with the company for the rest of my life. A lot of the people there grow within the company and they stay forever, but I don't think that's necessarily what I want to do. (Jennifer)

Renee was concerned with the perceptions of her as becoming complacent for wanting to start a family, which conflicted with several of her ambitious peers who vehemently opposed the notion of settling down:

Also, not wanting to be complacent at that point in my life. I do have a lot of friends who are super aggressive or when it comes to careers, super ambitious; and they look down upon people who are complacent where they are. And I'm like, there's nothing wrong with that. You can start a family or you can get married, there's nothing wrong with wanting to settle down. (Renee)

**Happiness/Satisfaction**

The third cluster of UOS associated with possible selves and Professional Goals involves the participants’ comments about happiness and satisfaction. Wesley, Jennifer, and Renee were
extremely vocal in expressing what would or would not contribute to their happiness as it related to their future work-selves.

When describing multiple versions of her possible selves, Wesley explained how her happiness might vary according to the results of her job search. Each schema represented a different level of satisfaction regarding whether she liked or hated the kind of job she chose. For instance, Wesley referred to the “Bum Me” where she chooses an occupation that she hates and ultimately quits to work somewhere unrelated to engineering, followed by the “Mistake Me” where she accidentally chooses a job that she dislikes but continues searching, and the “Settling Me” where she accepts a job that is not ideal but is tolerable:

“Mistake Me,” but that's kind of like “Bum Me.” It's like, I find out I hate my job and I have to find another one. Or no, not that I hate my job, but I hate biomedical, specifically. And I have to just search through other jobs, and I hate it. I can't stand it. I'm like, “This isn't the life for me. I can't deal with it.” And I end up quitting that job. I don't know. I get a random job, a secretary job, or a barista or something like that. . . . I think “Bum Me” is probably the worst-case scenario. But like, “Mistake Me” is probably second. Because, I don't think I would have enough motivation to keep hopping jobs. I would become the “Settling Me.” That's a lot of searching to find happiness. (Wesley)

After initially sharing her concerns about potential earnings, Jennifer immediately directed her attention toward a preferred work site location. Wanting to work and live near her family was extremely important to her. Jennifer believed that her decision to relocate would determine whether or not she would be happy:

Yeah. If I get a pretty decent paycheck, I would be happy with it living closer to my family than getting so much more and being across the United States, or something like that. . . . A lot of engineering jobs are like, “Would you be willing to relocate?” And everybody just feels like they have to say yes. Of course, I say yes. But if I get that job, would I really be happy? (Jennifer)

Renee’s idea of happiness mainly involved her plans to start a family. She was just as comfortable with the thought of settling down as she was when thinking about pursuing a
successful career as a professional engineer. Renee constantly promoted both concepts, and advocated maintaining work-life balance in her future:

You can start a family or you can get married, there's nothing wrong with wanting to settle down. As long as you're happy, and that's actually my goal. I just want to be happy. It might not be that I'm super successful in a company, or I might actually want to stay at home and be with my family. So, in the future - finding that balance between family and work and having that successful career. (Renee)

Graduate School

The fourth cluster of UOS associated with possible selves and Professional Goals involves the participants’ comments about making plans to attend graduate school. Jane, Willow, and Jennifer were all considering the possibility of pursuing an advanced degree. However, their reasons for why they wanted to attain that goal varied.

Jane mentioned that graduate school was one of the options she was entertaining as part of her CGS process, but she was reluctant to share why she planned to earn an advanced degree. She speculated that in the next five years, “I'll either be completed with grad school, or I mean, I might go on to get my doctorate.” Again, Jane never disclosed what type of program she wanted to enroll in nor which skills or opportunities she hoped to gain as a result.

Although she was considering graduate school as a career goal, Jennifer seemed very unsure about why she wanted to go. She pondered whether or not she really wanted to pursue another degree at her undergraduate institution, which she identified as a comfortable space, simply because she felt lost in her current developmental stage:

And I'm also considering grad school, but am I considering grad school because I'm lost in life, or am I considering grad school because I honestly want to go? . . . If I get accepted here and I get a nice assistantship, I will stay because I think I'm comfortable in this area. . . . So, I'd go to school here again because I'm comfortable, and I wouldn't have to re-establish myself. But then, those two questions - Do I honestly want to go to grad school? Or am I going just because I'm lost? (Jennifer)
Willow, on the other hand, was very intentional in her plans to attend graduate school as well as the type a degree she wanted to earn. She had been considering a joint engineering and business degree as part of the MBA program at her state’s flagship institution, which aligned with her career goal to advance in management as a professional engineer:

Being a senior and graduating in December of next fall, I've been back and forth of whether or not I want to go to get my masters right after school or two years from now. I don't know how that company does things in terms of graduate [school]. I think if I go to grad school right after I graduate, I can still do their internships there. . . . I think I'm going to graduate, and then, go back and get my masters. . . . Either way, I still want to get my MBA, but there's a specific MBA I want. It's a dual program at [the state flagship], and it's a business and engineering - like MBA for engineers. (Willow)

**Work Tasks/Projects**

The fifth cluster of UOS associated with possible selves and *Professional Goals* involves the participants’ comments regarding the types of work tasks and projects they would prefer. Wesley, Jennifer, Willow, and Jane each shared their thoughts about what they wanted to do as professional engineers.

In trying to figure out which engineering occupation would be right for her, Wesley thought about two versions of her possible selves, in particular the “Settling Me” and the “Late-Bloomer Me.” The former version would have her settling with a job at an engineering company that is not in biomedical engineering, which is her top preference. In the latter version, Wesley would ultimately become employed as a biomedical engineer, but much later:

My “Settling Me” would be going to a job with [prominent engineering company] and stuff like that. . . . The “Late-Bloomer,” which is like, I get into a field, or I get to do what I want to do, eventually. I leave the job at [prominent engineering company]. I find a job in biomedical. And I'm like, "Oh, yes! Why did I wait so long to do this?" (Wesley)
Jennifer’s, Willow’s, and Jane’s comments associated with what Work Tasks/Projects that interested them were the same as their responses for Deciding What to Do. As I mentioned, Jennifer was majoring in industrial and systems engineering, but was unsure as to whether or not she wanted to pursue a career in that field. She also hoped to explore other occupations within engineering:

I see stuff that I don't want to do, but I don't know if this is the major for me. I guess our major is mostly focused on manufacturing and supply chain. . . . No, I don't want to be doing the same thing forever. (Jennifer)

Willow was largely interested in working with civil engineering projects, which she affirmed by sharing, “I either [sic] want to do infrastructure.” She also talked about her plans to earn a specific MBA degree that would help her advance into some sort of a leadership role. Willow was preparing in this way because she believed that the program “teaches you how to be in a managerial position for engineering.”

Jane expressed an interest in engineering occupations related to medical research and health care. She gave examples of the types of places where she envisioned herself working:

I would like to be working in industry, hopefully. Maybe with either like a pharmaceutical company, or maybe like a national research lab, or like a biomedical engineering firm. Working with medical devices is really what I want to do. (Jane)

A set of varying realities also emerged for Wesley and Willow in relation to Professional Goals and work tasks or projects. Both of the participants mentioned that they considered applying for rotational programs at certain engineering companies. For instance, when Wesley talked about settling or staying with the same engineering company she had interned with, she said, “The first internship I got was [prominent engineering company], and I haven't moved on. . . . I even applied for a rotational program with them.” She was using the rotational program to
either help her secure employment with a particular company or as something to fall back on if she was unable to find a job in the field she wanted.

On another note, Willow was planning to use the rotational program as a resource for her own professional development within an engineering company that she was interested in. This would serve as the first step toward helping to advance her career in engineering, after which she would go on to pursue her master’s degree:

There’s a certain rotational program I want to do once I graduate. I don't know how that company does things in terms of graduate [school]. I think if I go to grad school right after I graduate, I can still do their internships there. . . . I think I'm going to graduate and then do the rotational program for two years. And then go back and get my masters. (Willow)

**Personal Goals**

The second theme associated with the participants’ responses to the first iteration of possible selves involves their personal goals. I clustered those statements into two sub-themes. They include the participants’ comments about close relationships and the participants’ comments about family.

**Close Relationships**

The first cluster of UOS associated with possible selves and *Personal Goals* involve the participants’ statements in regards to their need for close relationships, both at work and in their personal lives. Jennifer and Jane spoke about how their connections with others played an important role in their future career success.

Jennifer was mostly concerned with being supported by her colleagues at a future place of employment. She examined a potential employer’s workplace culture and wondered if she would be able to establish ties with others once she began working there. She expressed her
need for close relationships, which she thought would translate well to that type of work environment:

I think what has definitely won me over in the company is their culture, how close they are. Like I was saying, I'm the type of person who loves relationships. So, they are very close. They want everybody to excel and they make sure they do what they can to improve you within the company. (Jennifer)

On the contrary, Jane was worried about keeping up with her circle of friends outside of the workplace. She wondered if she would still be able to maintain her ties with people in her personal life once she began her life as a professional:

Personally. I don't know. It really depends. Like right now I'm in a period of transition. So, it's like so many things are up in the air. You're not really sure where things are going to go because I know a lot of times it happens after graduation. You and your friends kind of go your separate ways, and I'm hoping to be able to still have close relationships with them as much as possible. (Jane)

**Family**

The second cluster of UOS associated with PS and *Personal Goals* involve the participants’ comments about family. Wesley, Jennifer, and Renee all responded in an individualized manner. I re-use some of the participants’ statements from the previous section on *Professional Goals* to also describe their thoughts and feelings about family in relation to their personal goals in this section.

**Wesley: Supporting myself and family.** From the previous section, Wesley mentioned having a version of possible selves that might settle on a job that is not ideal. However, she admitted that she would be satisfied with doing that as long as she was financially stable and could provide financial support for her family:
So, my “Settling Me” would be going to a job with [prominent engineering company] and stuff like that. You know, like, it's okay. I can live my life. I mean, I'm comfortable. I'm making enough money to support myself and my family and stuff like that. (Wesley)

**Jennifer: Being around family.** Based on Jennifer’s responses, two varying realities emerged associated with her thoughts and feelings about family. They included residing in close proximity to her family and accepting employment opportunities for less pay.

The first varying reality involves the location of Jennifer’s future work site and its distance from her hometown where her family resided. She talked about potentially having to make sacrifices by living and working in remote locations in order to advance at certain engineering companies. Jennifer struggled with the notion of relocating and pondered whether or not she would be happy if she was more than an hour and a half from her family:

But you have to be willing to move around and do stuff because it's a performance-based company." You have to be willing to do things nobody else wants to do like move to “the middle of nowhere Arkansas” for a few years and build yourself up. I'm like, "Okay. Well, I'm a city girl." I've been in the city my whole life and I know I want to be in the city. I interviewed in [name of large city] which is in the city. That's fine, but will I have to move around? I don't know if I'm comfortable with not being comfortable. . . . Geography - would definitely love to be in the [hometown] area. Probably no more than an hour and a half away from family so that if I do want to go back home for a weekend or something, I can go back home. . . . So, that's what I'm struggling with now. (Jennifer)

The second varying reality involves Jennifer’s consideration of employment positions that offer lower salaries just to be able to live near her family. She believed that living closer to home would actually make her happier regardless of how much she might be able to earn:

If the money wasn't that far off, I'd take a lower salary just to be around my family. . . . People look at companies and they're like, "I'm getting eighty thousand from here," like, I'm definitely going here. I've never seen that much money so I don't think it has that much of an influence on me. . . . Yeah. If I get a pretty decent paycheck, I would be happy with it living closer to my family than getting so much more and being across the United States, or something like that. (Jennifer)
Renee: Balancing career and family. As I mention in the theme related to the participants’ Professional Goals and their happiness/satisfaction, Renee had ambitions of starting her own family and was concerned with how she might maintain work-life balance once she began her career. She struggled in finding ways to manage both her career ambitions as well as her needs for a family life simultaneously:

And I'm saying that it's impossible, but maybe at some point throughout your life when you have both career and family, something is going to lag behind before you're able to find that balance and mesh well together. . . . You can start a family or you can get married, there's nothing wrong with wanting to settle down. As long as you're happy, and that's actually my goal. I just want to be happy. It might not be that I'm super successful in a company, or I might actually want to stay at home and be with my family. So, in the future, finding that balance between family and work and having that successful career. Who am I trying to prove myself to? Myself or other people? (Renee)

The Second Iteration

At the beginning of the second interview, I asked the participants a second question related to PS, prompting them to reflect on their comments from the first interview about who they imagined they would be in the next five years. After that, I encouraged them to expand on those remarks by describing themselves in a future career setting. The participants responded by talking about their interests, expectations, and aspirations related to their respective career choices. Several of the underlying themes from the First Iteration of possible selves also emerged in the second iteration. Therefore, I grouped their responses from the Second Iteration into the same general themes that describe their aspirations both professionally and personally. A representation of the explication process for the Second Iteration and emergent themes and sub-themes is illustrated below in Figure 7.
Figure 7. Category: Second Iteration of Individualized Clusters with emergent themes and sub-themes.

Professional Aspirations

The first theme associated with the participants’ responses to the second iteration of possible selves involves their thoughts and feelings about their professional aspirations. I clustered those statements into one main sub-theme, which focuses on the career specialties that the participants were most interested in.

Career Specialty

The primary cluster of UOS associated with possible selves and Professional Aspirations involve the participants’ comments about which career specialties they considered the
most. Each of them provided vivid descriptions regarding the type of engineering projects they hoped to be engaged in the next five years.

Jennifer was somewhat dissatisfied with her major. However, she hoped to enhance her technical skills, perhaps in the area of data analytics. Therefore, she was planning to enroll in a graduate program that could help her become a specialist in that field:

The four years I've been in industrial and systems engineering, I don't really like it. So maybe I can go off and get like some kind of technical background making data analytics or something. It's up and coming, but I know it's useful to every single company. And then, you know, make some more money off of that. . . . Yeah, so they have like an MBA program here. It's more focused on like data analytics rather than like the management side. (Jennifer)

Renee’s comments related to this sub-theme are derived from her previous remarks that I used to explain the sub-theme Identifying as a Minority in General in Social Contexts. Again, she was confident that she would be working at an engineering company where she had recently interned, and expressed a high interest in providing leadership for one of the organization’s MRGs:

So, five years? I can honestly see myself just working with a full-time job. . . . I don't know what my position will be. Who knows? I'll probably be involved with their [company] resource groups, which is like their minority groups, Hispanic and their Black group. They actually have all kinds, veterans, LGBTQ, all of that. (Renee, Social Contexts, p. 114)

Willow’s future work-self involved her plans to make a national impact on the field of engineering. She talked about wanting to, “take my experience and work on projects all around.” Willow also saw herself moving to the west coast and, “definitely being in California, building infrastructure, and being a part of those projects.”
When thinking about future work-self, Jane was very specific as well. She shared that, “I’d hope to be probably working for either a pharmaceutical company or a biomedical device company. Maybe government, maybe like NIH.”

Wesley was not as specific as the other participants were in terms of what she envisioned herself doing, but she did express interest in any job that required her to solve problems. She also thought that her future work-self might vary depending on her job responsibilities:

The work-self that I am would depend on the job that I’m in and how much I like that job. But, most likely, I feel like working hard at whatever job I’m doing because I like working, and I do like engineering, . . . Whatever job I am in will require me to solve problems. . . . I'll be okay with solving problems. That's something that will satisfy me. (Wesley)

In addition to the larger cluster related to how participants considered career specialties as part of their CGS processes, four distinct sets of varying realities emerged as well. They include the participants’ career interests related to managerial opportunities, helping others, gaining new experiences, and uncertainty about what they will be doing.

The first set of varying realities includes Renee’s, Jennifer’s, and Willow’s aspirations to pursue managerial opportunities, which were different from the other participants’ aspirations relating to more traditional engineering tasks or functions. For instance, Renee wanted to enhance her leadership skills so that she would be better equipped for future roles in management:

I want to say management, maybe. But even thinking about managing a whole group, and especially still being under 30, is very intimidating. I'm still working on my leadership skills and all of that, so hopefully five years from now, I'll be really solid. (Renee)

Willow also envisioned herself serving in a leadership capacity. She speculated that, “At work, I feel that I will be, basically, being in a managerial position.” Jennifer, on the other hand,
CAREER GOAL-SETTING OF BLACK WOMEN ENGINEERS

decided to take an alternative approach, which included acquiring more technical skills instead. For example, when previously examining which career specialties the participants were considering, I mention that she planned to enroll in a particular graduate program that concentrated on data analytics rather than management.

Another set of varying realities involves the participants’ comments about being employed in engineering positions that gave them opportunities to help others. For instance, Jane preferred jobs that improve the quality of life for health care patients somehow. She explained, “So I guess one of the reasons why I picked my major, wanted to go into biomedical engineering, is because I really wanted to help people at the end of the day, wanted to make their lives easier.”

Mirroring that same cause, Wesley was satisfied just in knowing she might be doing something that helped people in general:

It's one way that you can help people by making sure they can get from point A to point B safely. . . . If I'm not in a field that I think helps people, I don't know. . . . I'll need something that will make me at least a little bit happy. I mean, it depends on what field it's in because I want to help people and that's another bit of what would make me happy. (Wesley)

Willow decided that she wanted to help others by participating in training activities and instructional videos for new employees at her company:

And also, since I'll be a little older, having a hand in making some of those videos, and teaching people how to do my job. . . . Because the more you teach people your job under you, the more you can move up, and the more people will look up to you and not envy you, I guess. Because they realize that you're just trying to help them. (Willow)

The third set of varying realities involves the participants’ comments about gaining experiences that they might be able to apply later on in their professional careers. Renee and
Jane sought ways to enhance their skills by engaging in on-the-job training. Jennifer and Willow hoped to do the same through educational advancement.

Renee talked about gaining work experience by participating with an engineering company’s rotational program. In the next five years, she anticipated, “At that stage, I'll probably still be with [prominent engineering company], because the rotational program I'm in is a two-year program, but after that they'll put me in a permanent placement within the company.” Jane wanted to become more knowledgeable in her field as well. She was also interested in learning how to apply those new insights to her future work situations, and elaborated, “So, I guess independence would be the main thing – gaining new experiences, traveling more, and then, just putting my degree to good use.”

Jennifer and Willow specifically mentioned taking a university course as an employee or enrolling in a graduate program as a full-time student. Again, Jennifer wanted to go back to school to specialize in another set of technical skills rather than her major of industrial and systems engineering. Willow thought about taking online courses through her company so that she could train others as an option for advancing her skill set educationally. She explained, “I guess for more detail I think I would be taking the company online courses. You know how some companies have university courses? Taking those and learning more about the company.”

A fourth set of varying realities associated with participants’ career specialization involves their uncertainty about what they will be doing, which is similar to the sub-theme of Deciding What to Do in the first iteration of possible selves. Jennifer and Renee found CGS to be challenging, and they had no structured approach for planning their careers.
Jennifer struggled with the entire notion of setting goals. She felt lost trying to navigate her job search, and was unsure where she might end up. So, she started making attempts to create a formal plan that she could use to help guide her:

I'm the type of person who, I don't really like to put an age to a certain goal or something. . . . I don't really know where I want to go in the future. Like work wise and stuff, I'm still lost, still trying to find my way. I'm not sure where I can see myself, but I'm trying to start like writing goals and stuff, things that I want to do. . . I don't really write goals or anything. So, I think that will be helpful. (Jennifer)

Renee also admitted that she had not put much thought or effort into setting specific career goals for herself. As a result, she was fairly vague about what tasks or skills she wanted to specialize in or in which functional area she wanted to work:

When it comes to actual relation to my career, I don't know if I have an end goal in my career. Honestly, I just take it step by step. If another opportunity presents itself, then I'll take it if I think it seems fitting or one of my mentors thinks it would be a good idea to explore that option. But anything specifically, I don't know at all past my degree. (Renee)

Personal Aspirations

The second theme associated with the participants’ responses to the second iteration of possible selves involves their thoughts and feelings about their personal aspirations. I clustered those statements into three sub-themes, which include the participants’ goals related to location, financial stability or support, and travel.

Location

The first cluster of UOS associated with possible selves and Personal Aspirations involve the participants’ comments about their future work locations. Jane and Renee vocalized where they wanted to live in the next five years and why those locations were important to them.
Jane considered moving somewhere other than her hometown because she wanted to establish herself independently once she began transitioning into the professional world. She explained, “I would like to live in a new city at least once, because I've lived in [home state] my whole life. So, maybe moving and being able to figure stuff out on my own.”

Renee was heavily considering making a home for herself on the west coast because of a company she had interned with. However, she also thought about moving back to the east coast where she was from perhaps to settle down ultimately:

Ideally, five years in the future, I'll either still be exploring some part of the states or international, because I do want to go to the west coast to kind of explore that side. . . . So, I feel like in terms of [prominent engineering company], I'll either be in the [Washington state] area or somewhere in California. If not, maybe I make my way back to the east coast. Long-term-wise, thinking like 10-15 years down the road, I want to come back to [hometown] area because I really like that area. And I think it's a good place for me to be just me, personally. It's the place where I want to settle down. (Renee)

Financial Stability/Support

The second cluster of UOS associated with possible selves and Personal Aspirations involve the participants’ comments about their intention to either become financially stable or provide financial support for their families. Jane and Jennifer both were personally motivated to achieve financial independence by pursuing a career in engineering.

For instance, Jane wanted to be responsible for her own finances, relinquishing that burden from her parents. She explained, “Mainly, I just want to be financially independent. Like that's my main goal, just because I feel like after a while, you get tired of asking your parents for stuff. So, I'm just ready to be financially independent, mainly.”

Jennifer not only thought about becoming financially stable as a professional engineer, she actually wanted to help her relatives by supporting others in the household:
CAREER GOAL-SETTING OF BLACK WOMEN ENGINEERS

I feel like I'm going to live with my mom until I move out and get married or something. I don't know how much money that I'm going to make, but I do want to help out in the house. . . . In terms of how much I should be making, I don't know what's like acceptable or what's a lot of money. So, I don't know. (Jennifer)

**Travel**

The third cluster of UOS associated with possible selves and *Personal Aspirations* involve the participants’ comments about their desire to travel. Jane and Willow mentioned that traveling was a personal goal of theirs. As she began establishing her professional career and learning more about the engineering profession, Jane hoped to incorporate travel as part of that process. She expressed an interest in, “gaining new experiences, traveling more.”

Willow also saw travel as an integral part of her career development. She was particularly attracted to the west coast and abroad, as she wanted to work with major infrastructure projects all across the nation:

Traveling. I really want to travel, and not just be in [home state], but take my experience and work on projects all around - maybe out [of] the country too. I've never really thought about being out [of] the country too. I've never really being in California. . . (Willow)

**The Third Iteration**

At the end of the second interview, participants were asked a third and final question related to PS in the form of a prompt. I inquired about which possible selves participants thought would be true for them in the next five years, which included either a hoped-for self, an avoided self, and/or an expected self. Once again, the participants’ comments varied. Therefore, I grouped their statements into three sets of themes that aligned with the possible selves schema of hoped-for, avoided, and expected selves. Within these sets, individualized sub-themes also emerged based on each participant’s responses, which I labeled accordingly. A representation of
the explication process for the Third Iteration and emergent themes and sub-themes is illustrated in Figure 8.

<table>
<thead>
<tr>
<th>Category</th>
<th>Themes</th>
<th>Units of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individualized Clusters</td>
<td></td>
<td>Hoped-for Self</td>
</tr>
<tr>
<td>Third Iteration</td>
<td></td>
<td>All sub-themes were individualized.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The “ Motivated Me” (from the First Iteration)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Building Confidence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Being Happy and Healthy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remaining Positive and Moving Forward</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial Independence/Stability</td>
</tr>
<tr>
<td>Expected Self</td>
<td></td>
<td>All sub-themes were individualized.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The “ Mistake Me” (from the First Iteration)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Being Laid-back/Lazy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Miserable/Unhappy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Being Negative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Burning Out</td>
</tr>
<tr>
<td>Avoided Self</td>
<td></td>
<td>All sub-themes were individualized.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The “ Settling Me”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Having a (Well-paid) Job</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Being Happy and Healthy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Traveling and Story-telling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Managing Stress and Maintaining Relationships</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial Independence/Stability</td>
</tr>
</tbody>
</table>

Figure 8. Category: Third Iteration of Individualized Clusters with emergent themes and sub-themes.

Hoped-for Self
The first cluster of UOS associated with the participants’ possible selves involves their thoughts about who they hoped to become in future work conditions. Jennifer, Willow, Renee, and Jane each provided a series of responses that either described who they ideally wanted to be or provided details about certain jobs that they wanted. Interestingly, Wesley refrained from commenting about a hoped-for self during the third iteration of possible selves. However, she mentioned having a “Motivated Me” in her response to the first iteration, which she considered to be her idealized future work-self.

**Wesley: The “Motivated Me”**

Wesley’s comments related to this sub-theme are an elaboration of her previous remarks that I used to explain the sub-theme *Deciding What to Do* in the first iteration. Again, she was thinking about ways to secure a job as a biomedical engineer:

> So, that's a version of myself where I do get into biomedical. Because I'm still working on it. Trying to get into the biomedical field and stuff like that. I'm still trying to get research. I might not get the minor that I'm working towards. But like, I'm still trying to get into at least research. If I'm able to get into research, I think that I might be able to get a job in biomedical. (Wesley, First Iteration)

**Jennifer: Building Confidence**

Jennifer hoped to become more confident in her abilities as well as encouraging others in the process. She also hoped to work in professional roles where she can help develop new employees at her future place of employment:

> Hope to have more confidence in myself, . . . and hopefully to grow from that, and pass on confidence to other people. . . . Hopefully, when I get into a job, maybe I can become some kind of - I know this barely happens, but people in jobs that, not necessarily recruiters, but who work with the younger people who come in. So that's what I want to do. . . . They only pick maybe one or two people in every single company or something, or every single building to work with the people who are coming in. And live close to home, hopefully in [her hometown], my number one. . . . But hopefully, I'll be home. (Jennifer)
Willow: Remaining Positive and Moving Forward

Willow was similar to Jennifer, in that she embraced a positive frame of mind. She hoped to practice resilience whenever she faced adversity in future work situations and wanted to share her experiences with others to inspire them as well:

Something I'm learning right now that I hope to continue is to anything that happens that I wasn't expecting, or is not like the happiest thing I was expecting, I want to, not make fun of it, but make light of it - kind of turn that into a positive to rebuild on that, and move forward. . . . Once I become that, I want to teach other people to do that. People have taught me how to do that, and friends have taught me how to do that. I'd like to teach other people how to do that, because I find that it makes life easier, and more fun. (Willow)

Renee: Being Healthy and Happy

Renee hoped to enjoy what she might do professionally and to be in a positive space in the next five years of her life. She also thought she would be happy if her friends and family were around her as well:

Hopefully, finding something, . . . do something I actually love, like looking forward to going to work. That's also an important aspect, and being in a positive and healthy and friendly environment. . . . Hopefully, learning a lot of life experiences, still have all my friends and family, hopefully, new members of the family and friends. God, I hope my sister will get married and have a baby by then. I really want to be an aunt. Yeah, honestly, just happy. That's my answer to everything. I just want to be happy. (Renee)

Jane: Financial Independence/Stability

Jane hoped to be financially stable in the next five years, which she believed was possible if she could secure a good job. She also had dreams of starting her own business in addition to generating multiple sources of income:

Hopefully, find a good paying job, because obviously I said I want to be financially independent. I want to be financially stable, but I also want to be able to have a couple of some luxuries in life, like enjoy myself since I've been in school for so long and broke. I
want to be able to enjoy myself a little bit. . . . And then I've always had a dream of having my own business. So, I guess that's a hoped-for, because I still don't know what I would want that to be in. But I guess having multiple streams of income is something I hope to be able to attain, because you never know what's going to happen in the life. So, it's important to have multiple streams of income. (Jane)

Avoided Self

The second cluster of UOS associated with the participants’ possible selves involves their thoughts about who they wanted to avoid becoming in future work conditions. Jennifer, Renee, and Jane were the most vocal regarding which behaviors they hoped to avoid in their professional lives. Again, Wesley described two possible selves that she hoped to avoid in the first iteration. However, she refrained from mentioning an avoided-self entirely in the third iteration. Willow was also limited in providing remarks, but she did comment.

Wesley: The “Mistake Me”

Wesley’s comments related to this theme are derived from her previous remarks that I used to explain the sub-theme Happiness/Satisfaction in the first iteration. One of the possible selves that she wanted to avoid she referred to as the “Mistake Me”:

“Mistake Me,” but that's kind of like “Bum Me.” It's like, I find out I hate my job and I have to find another one. Or no, not that I hate my job, but I hate biomedical, specifically. And I have to just search through other jobs, and I hate it. I can't stand it. . . . I think “Bum Me” is probably the worst-case scenario. But like, “Mistake Me” is probably second. (Wesley, First Iteration)

Jennifer: Being Laid-back/Lazy

Jennifer wanted to avoid taking a passive approach when it came to seeking opportunities in engineering. She believed that improving her confidence and becoming more trusting in her own abilities as an engineer would make her more assertive in her job search:

I'm so laid back. I want to become more of a go-getter. So, I want to avoid a little bit of the chill-ness, or [what] people call lazy or whatever. That's what I want to avoid. I want
to be a go-getter, and that plays into confidence. I want to feel confident enough to feel like I deserve to be here, or I know I can do it. (Jennifer)

Renee: Miserable/Unhappy

Renee was hoping to avoid being unhappy with her job and/or being unhappy with the place where she worked. She thought that she would be miserable under either of these circumstances:

Who I don't want to be? Miserable. Like one of those people that hate their job. My friend was texting me today. He graduated last semester, and he has his full-time job as an engineer. He was like, "[Renee] don't graduate." I was like, "Why not?" I was like, "Is adulting not going so well?" He was like, "No. I hate it. It's awful. Don't graduate. . . ." I don't want to be that unhappy where I'm working or just where I'm at in life. But just being miserable. I don't want to be miserable, at all. I'm trying to avoid that. (Renee)

Willow: Being Negative

The possible selves that Willow wanted to avoid was the exact converse of her hoped-for self. She was most concerned with maintaining a constant positive outlook and disavowing any thoughts of negativity that might distract her from realizing her ideal career-self. Very simply, she stated, “Who I don't want to be like is someone that's really, really negative.”

Jane: Burning Out

Jane reflected on how she had sometimes overextended herself in the past and wanted to avoid situations that might lead to possible burnouts for her in the future. She talked about making efforts to manage her workload and reduce stress overall as an essential means for preserving her mental health:

Avoidance, I guess sometimes when I get a little stressed, I start to burnout. Sometimes I go a little bit more than I should be doing, do a little bit more than I should be doing. So, I can retreat. And basically, I've seen what it looks like. So, halfway through my time in college, I got burnt out, and I started doing bad in my classes. I was just not doing well mentally. And so, I guess that's something I'm trying to avoid. Since I know what's going to take me over the edge, avoiding that edge of doing too much. (Jane)
Expected Self

The third cluster of UOS associated with the participants’ possible selves involves their thoughts about who they expected to become in future work conditions. Each of them provided responses, describing how they ultimately thought they would end up at the beginning of their engineering careers.

**Wesley: The “Settling Me”**

When thinking about who she expected to become, Wesley referred to the “Settling Me” version of her possible selves. She described this future work-self as somewhere between her ideal “Motivated Me” and her “Bum Me” or “Mistake Me,” which was veritably where she believed she would end up:

> I think I'll definitely end up somewhere in between because I have drive, but it's not anywhere where it needs to be to get to where I want to go - or not get to where I want to go, but get to where I'd be happiest probably. But I'm just like a settler, that's how I am... I think I'll just end up settling. (Wesley)

**Jennifer: Having a (Well-paid) Job**

Although Jennifer talked about wanting to improve her confidence in terms of her avoided-self, she was still fairly certain that she would be employed as an engineer in the next five years. She also knew that whatever position that she decided to accept would offer a decent salary as well. Jennifer noted, “I expect to have a job in the next five years! And a well-paying job!... Yeah, that's like a hope, expect, everything. That's going to happen.”

**Renee: Being Happy and Healthy**

Renee’s thoughts about who she expected to become involved her being happy, working in a healthy environment, and being surrounded by supportive people. She saw herself making a successful transition toward working full-time at her internship site and continuing the
relationships that she had established previously with mentors and co-workers at that engineering company:

Expected-self? Happy always. Happiness is always number one of what I want to be and who I see myself. And healthy. . . . But I think I won't have a problem making friends, especially opening the next chapter of my life, with [engineering company]. I have, actually, a few people that I've met from previous internships who are also working full-time with [engineering company]. And I've met other mentors who work within [engineering company]. So, I think I'll also have that support, no matter where I go. (Renee)

**Willow: Traveling and Story-telling**

Willow expected that she would have an engineering job that required her to travel on a regular basis. In addition, she would be employed in some type of position focused on leadership development that allowed her to share her experiences by way of telling stories:

I think in the next five years I'll be that person that's traveling and sharing my experiences. I love story-telling. Because I find too often that a lot of people are sometimes too stuck in the past. I know if I were to stay in the past, I wouldn't be here where I am. . . . So, I feel like I'll be traveling and sharing my experiences and story-telling. (Willow)

**Jane: Managing Stress and Maintaining Relationships**

Jane’s expectations were to accomplish three particular short-term goals. The first was to complete graduate school. Second, she wanted to continue focusing on her mental health and how she managed stress. Lastly, she expected that she would still maintain meaningful relationships with her family and friends after transitioning into the professional world:

So, I guess, I expect that I'll be able to make it through grad school. . . . I’d like to, I guess, focus more on my mental health. That's something that should be an expected, but it's probably more in a hoped situation. . . . I expect to keep a good relationship with my family and my friends. (Jane)
In summary, the findings in this chapter generally involve two subject areas that encompass several of the most salient themes and sub-themes, which include: the participants’ comments about their specific career aspirations or career goals, and the participants’ comments about their overall success and/or well-being. However, before expounding on these remarks, I need to first put them into a more meaningful context by clarifying what distinguishes one from the other. For instance, I define career aspirations as employment positions or roles that participants hoped to experience in the future. Whereas, I define career goals as specific tasks or projects that participants wanted to be involved with in the future, as well as milestones that they wanted to achieve en route toward finding a career.

The first subject area regarding the participants’ career aspirations and career goals involves several remarks that comprise the similarly labeled themes of Professional Aspirations and Professional Goals. In terms of career aspirations, all of the participants spoke about wanting to gain experience in specialized fields of engineering. They expressed interest in career specialties ranging from leadership, troubleshooting, and data analytics to pharmaceuticals, biomedical research, and national infrastructure projects.

In terms of career goals, the participants were mainly concerned with deciding what types of jobs or work tasks they wanted to engage in as future engineers, thus, reaffirming their need to find a career specialization. However, some of them also wanted to achieve certain accomplishments over the next several years such as getting involved with engineering rotational programs and attending graduate school. As a result, participants talked about using those rotational programs as opportunities to help them develop professionally and to secure employment with engineering companies. They also mentioned that they were considering graduate school as an option for completing their career goals, which included preparing
themselves for managerial roles as well as working toward establishing their own businesses someday.

The second subject area regarding the participants’ overall success and well-being involves several remarks related to the sub-themes of *Career success* and *Happiness/Satisfaction* associated with *Professional Goals* in addition to the sub-theme of *Family* associated with *Personal Goals*. In terms of their overall success, the participants envisioned themselves in several variations of work roles and life situations that they considered to be ideal along with a couple of alternatives that were not so favorable. Similarly, they projected their well-being based on the probability of them liking or disliking their job, being able to find employment in locations near their nuclear families, or being able to entertain the possibility of starting their own families.

In terms of the participants’ comments related to family, although they were associated with *Personal Goals*, they were either re-used from or very comparable to the participants’ comments regarding their *Professional Goals* and *Career Success*. Again, the participants elaborated on how they wanted to reside in close proximity to their families, help provide them with financial support, and find balance between maintaining a family life and managing a successful career simultaneously.

Lastly, although the findings in this chapter are organized into two separate parts, it is evident from the participants’ responses that both subject areas are interconnected. As a result, the findings reveal that the participants’ thought-processes related to their career aspirations, goals, success, and overall well-being were more holistic rather than individual according to each aspect. Furthermore, this illustrates how the participants’ professional and personal interests fused throughout their CGS processes, which directly influenced their construction of future
work-selves. Therefore, the findings in this chapter contribute to the current literature on possible selves as well as expand the scholarship surrounding CGS.
Chapter Six

Discussion

The focus of the study was to understand the experiences of Black women in college who majored in engineering while in the process of constructing their idealized career-selves. In regard to career development, the literature has already explored career planning and CDM theories, which also includes research on Black women’s experiences in engineering disciplines as well as engineering occupations. This body of work encompasses studies about the barriers they face in those settings such as gender and racial bias, social isolation, and a lack of support from peers, colleagues, faculty members, and/or supervisors. The findings in this study overlap with these claims in existing literature on multiple occasions. However, prior research fails to address the specific developmental contexts that influence BWEMs’ CGS processes in addition to the aforementioned social contexts.

Therefore, the study explores this gap by examining BWEMs’ experiences as college seniors transitioning into the workforce, particularly in industrial fields of engineering. Also, despite scholars’ previous use of possible selves theory to explain how Black college women, undergraduate engineering students, and higher education professionals engage in their respective career planning processes; the framework has yet to be implemented with participants who represent a combination of each of those characteristics, such as BWEMs. Again, this dissertation will provide insight into these areas.

The study's findings provide three major contributions to the literature: 1) reaffirming that parental support, racial identity development vis a vis same-race role-models, and value systems (i.e., one’s attachment to societal causes, and expectations of relatives and community members) significantly influence how BWEMs make decisions about careers; 2) a deeper
understanding of possible selves theory and how it applies to this sample population; and 3) new insights into the roles that race, gender, and developmental stage each play in BWEMs’ CGS processes.

This chapter generally explains what the findings of this study mean and how they contribute to new knowledge regarding African American women who are pursuing STEM degrees and occupations. First, I will provide answers to the research questions presented at the beginning of the study. Second, I will discuss the findings in relation to prior research and policy. Third, I will present implications for future practice, research, and policy. Fourth, I will share several of the study’s limitations along with possibilities for future work. Finally, I will conclude the chapter by summarizing how the study adds to the current literature regarding possible selves theory and/or conceptual models pertaining to career planning.

The next several sections synthesize the findings from Chapters Four and Five, by which I attempt to answer the main research question: “What is the lived experience of constructing an idealized career-self as part of the CGS process among BWEMs?” To explain the phenomenon more clearly, I first needed to address the three research sub-questions based on Lee and Oyserman’s (2009) individual and contextual factors, and the interview questions that directly relate to possible selves. Therefore, the following sections highlight the most significant findings from Chapters Four and Five, which I organized similarly according to the participants’ past experiences, developmental contexts, social contexts, and individualized descriptions about their future work selves.

**Past Experiences**

The first research sub-question asks how have past experiences of success and failure related to engineering influenced the way BWEMs set future career goals. In terms of the
participants’ past successes, the findings reveal that before they became engineering majors, they professed to having been good at math. This then led them to have conversations with others who encouraged them to consider career options in engineering. As a result, the participants decided to pursue engineering while still in high school, despite the fact that most of them knew little about what those types of occupations engineering entailed prior to attending college.

Another contributor to the participants’ past successes involves their pre-engineering support systems. As I alluded to previously, the participants interacted with specific people during high school and their first year of college, whom they credit with shaping their career goals in regard to engineering. These individuals include friends, classmates, parents, and older relatives. In terms of peer support, the participants viewed their friends and classmates as sources of motivation or sometimes as competitors who helped push them toward achieving their career goals. However, in terms of family support, the participants’ saw their parents and other older adults as either being inspirational or as role models who initially provided them with encouragement as they began college.

On the contrary, the findings also reveal several of the participants’ past failures or challenges they encountered en route to becoming engineering majors. One significant aspect involves the amount of anxiety that participants experienced, particularly during their freshman and sophomore years. They expressly mentioned that those two years were the most stressful times of their college careers for a number of reasons, which are best explained according to the sub-themes from Chapter Four in association with *Becoming an Engineering Major* (i.e., *Coping with Academic Stress, Belonging in Engineering, and Career Exploration*). In so many words, the participants characterized their anxieties around *Coping with Academic Stress* as not being
able to get into engineering initially, struggling with courses, getting through classes, and trying not to fail out of engineering.

The participants’ anxieties in regard to Belonging in Engineering were equally as intense, as they found it difficult to develop an attachment to engineering, gauge their interests, figure out what they wanted to do, or find an engineering track that they felt passionate about. Several of the participants wondered if certain majors were actually for them, and contemplated “switching” or getting out of engineering. Similarly, the Career Exploration process also added to their stress, as the participants were disappointed with the introductory courses and information sessions they were required to attend during their first year of college, which were supposed to help them explore the various majors within engineering. They also expressed frustration with faculty members’ unrealistic expectations for them to “sort” or figure things out on their own and select a major by their sophomore year without receiving the appropriate guidance.

Ultimately, the participants responded to the aforementioned challenges by seeking assistance from various campus resources, as they gravitated toward supportive communities that were composed of their peers as well as mentors of the same race and/or gender. The findings in this segment represent another of the participants’ past successes and segues to the next section that refers to developmental contexts that influenced how they were setting career goals closer to the time of the interviews.

**Developmental Contexts**

The second research sub-question asks how do developmental contexts (i.e., current academic, occupational, and interpersonal experiences) influence the way BWEMs set future career goals. In terms of their academic experiences, the findings indicate from the theme
Specific Steps that participants engaged in tasks such as getting good grades in their undergraduate classes, looking for internships, and preparing for graduate school by studying for entrance exams, seeking assistantships, and finding ways to pay for their graduate education. In addition, a salient sub-theme from What Mattered Most, involves one participant’s negative experience regarding a Lack of Guidance/Parental Advice. She acknowledged her struggles as a first-generation student in engineering and thought she could have benefited from having parents who had been through a similar academic process and understood exactly what she was going through.

In regard to the their occupational experiences, the findings associated with the sub-theme Seeking Employment Opportunities (via Specific Steps) reveal that participants were preoccupied with tasks such as searching for full-time jobs, exploring various research opportunities, and preparing for future management roles by engaging in student leadership activities and engineering rotational programs where they were able to make connections with co-workers, find mentors, enhance their conflict management and communication skills, and gain professional experiences in general. Also, the findings associated with the theme What Mattered Most shed light on the types of accomplishments or issues that participants were thinking about in relation to their future career selves such as financial stability, potential relocation and concerns about social climate in the communities surrounding those worksites, gaining on-the-job experiences, and improving their abilities to perform work-related tasks.

From an interpersonal perspective, the findings associated with the theme Specific People indicate that the participants’ interactions with mentors have the single most positive impact on their CGS processes. The participants’ comments from the sub-theme Guidance from Mentors illustrate how faculty, administrators, and graduate students collectively made up a
support system that provided them with the assistance they needed in order to succeed in engineering. In several descriptions, the MEP office was explicitly mentioned as the primary location where they found mentors. In addition to mentor support, the findings highlight the importance of peer-to-peer interactions as well. The sub-themes Need for Peer Support (varying reality via Guidance from Mentors) and Competing with Peers (via Understanding CGS) point out that participants relied on their friends and classmates for social, academic and emotional support all throughout their experiences as engineering majors.

Another significant element of the findings related to peer interactions involves the participants’ notion of peer competition, which is also illustrated in the Need for Peer Support and Competing with Peers sub-themes. Interestingly, this concept either served as a healthy form of motivation that challenged participants to step up and accomplish certain tasks, or it occasionally added to their anxiety associated with seeking employment or internship opportunities. For instance, one participant’s comments from Understanding CGS epitomizes the latter sentiments almost entirely, as she acknowledged her lack of social capital regarding professional networks and rejected self-promoting behaviors that coincide with the competitive nature of job searching in engineering. This provides another example of proof that BWEMs thrive in more cooperative and less competitive environments that are designed to help them advance academically and professionally.

Social Contexts

The third research sub-question asks how do social contexts, including the racial and gender disparities in engineering, influence the way BWEMs set future career goals. As I mention in Chapter Four, the findings related to social contexts involve comments that participants made in reference to race and/or gender when sharing their experiences. Again, I
grouped their remarks into both *Explicit Themes* (that directly refer to race/gender) and *Implicit Themes* (that indirectly refer to race/gender), using several of those statements from the participants’ developmental contexts to also describe their social contexts.

In terms of the *Explicit Themes* associated with the participants’ social contexts, the findings indicate that interactions with peers and mentors of the same race and/or gender significantly influenced the participants’ CGS processes. The sub-theme *Need for Peer Support* illustrates how the participants looked to establish connections with their same-race and same-gender peers as a means of coping with the racial and gender disparities that exist in engineering. Ethnic- and gender-based support groups such as NSBE, an academic support network, and an engineering LLC for women were all mentioned by participants as involvements that helped them socialize as African Americans and as women in engineering at their institution (PWI).

Additionally, the findings also reveal that same-race, same-gender mentors had a similar impact on the way that the participants set career goals. For instance, based on their comments from the sub-theme *Interactions with Mentors*, the participants benefitted tremendously from the relationships they developed with a Black woman graduate student and a Black woman senior faculty member. These individuals not only provided them with encouragement and support, but they also enlightened the participants of various educational resources and professional development opportunities that they used to make informed decisions regarding their career goals.

In terms of the *Implicit Themes*, the most significant part of the findings in this section involves the participants’ comments regarding the *MEP Office* and their *Advice to Other BWEMs*. Although the participants gave rather glowing testimonies about the MEP office in
general, they rarely mentioned the names of specific programs or organizations featured through the office that assisted them. Nonetheless, they acknowledged how impactful the MEP office and its staff members were in shaping their CGS processes by increasing their exposure to certain engineering companies, which helped them to expand their professional networks.

In regard to the participants’ Advice to Other BWEMs, their comments, although individualized, focused on two general topical areas: Making Connections and Seeking Help, and Remaining Resilient. The most significant findings are associated with the former topical area, which reiterate how much participants valued the need to build connections with others, interact with peers and mentors, and establish communities of support. These actions along with embracing mind-sets to push through adversity and use their stories of perseverance to help motivate others proved to be beneficial for participants they navigated their CGS processes.

**Individualized Clusters**

The findings related to the individualized clusters involve the participants’ comments in response to the three questions related to possible selves. When providing descriptions about their respective possible selves, most of the participants’ cognitive processes evolved as they answered each question. For instance, in the first iteration, they were somewhat uncertain about what they would be doing in the next five to seven years; in the second iteration, they began to focus more about their career plans and how they would execute them; and in the third iteration, they seemed to have crystallized who they wanted to become in future work conditions. Therefore, the questions about possible selves might have served as an intervention for helping the participants synthesize or think through their identity formation processes.

**First Iteration**
For the first question related to possible selves, the participants were asked who did they expect to become in the next five years. Based on their responses to this particular inquiry, the most significant findings are related to the theme Professional Goals, which reveal that the participants were mainly concerned with being successful in general as well as finding specific roles in engineering that were most ideal for them. Their comments from the sub-themes entitled Career Success, Deciding What to Do, Specializing (varying reality via Deciding What to Do), and Work Tasks/Projects further elaborate on the participants’ career interests by describing exactly which areas of engineering they wanted to be involved with or specialize in.

Another notable aspect of the findings associated with Professional Goals that is worth mentioning involves the participants’ anxiety around making the right career decision or picking the right job. For instance, the sub-themes Settling/Getting Stuck (varying reality via Deciding What to Do) and Happiness/Satisfaction both suggest that participants were interested in engineering jobs that provided them with multiple task options, encouraged employee development and opportunities for advancement, promoted work-life balance, and offered work sites close to their families. The participants’ preferences to find jobs located near their families and/or start families of their own were prevalent throughout their CGS processes, as they also emerge in their comments associated with Personal Goals in the sub-theme Family.

Second Iteration

For the second question related to possible selves, the participants were asked who they imagined they would be when they were 25-29 years old, and then were prompted to describe who their future career self would be like at that age. Based on the participants’ responses to this inquiry, the findings mostly pertain to the theme Professional Aspirations and sub-theme Career Specialty, which again reveal that the participants focused on specializing in particular roles
within engineering. Several of their potential interests included career fields such as data analytics, infrastructure projects, pharmaceutical research, and biomedical engineering. Additionally, the participants’ comments from the varying realities associated with Career Specialty illustrate how they also directed their ambitions toward the areas of Managerial Opportunities, Helping Others, and Gaining Experiences.

Similar to the sub-theme Deciding What to Do in the first iteration, the notion of anxiety re-appears in the second iteration of findings, this time as one of the varying realities associated with Career Specialty entitled Uncertainty about What They Will Be Doing. The sub-theme describes the participants’ candid admission of how they struggled to create organized career plans for themselves, nor had they seriously mapped out what professional goals they wanted to achieve other than simply earning an engineering degree. Other recurring elements involve remarks from two sub-themes associated with the theme Personal Aspirations, which include Financial Stability/Support and Location, with the latter re-emphasizing topics from the sub-theme Family (via Personal Goals) in the first iteration. These types of re-emergence are prevalent throughout the findings and provide evidence that those aspects are significant factors in the participants’ career planning process.

Third Iteration

For the third question related to possible selves, the participants were prompted to talk about the possible selves they thought would be true for themselves in the next five years, based on what they had constructed about their past and present life experiences in the interviews. The participants responded to the third inquiry in alignment with the possible selves schema (i.e., hoped-for, avoided, expected), which were identified as themes in Chapter Five. Therefore, I also organized the most significant findings in the third iteration according to those themes.
Hoped-for Self. The findings indicate that the consensus of the participants’ ideations regarding the Hoped-for Self involve them wanting to embody a positive mind-set, assist with employee development (helping others), and remain close to their families (location). All of these elements recur from previous developmental contexts and iterations. In addition, financial stability also re-emerges in these findings similar to its presence in the second iteration with the sub-theme Financial Stability/Support (via Personal Aspirations).

Avoided Self. In regard to the participants’ ideations of the Avoided Self, the findings reveal what types of perceptions they had about undesirable future work conditions, which entailed them possibly hating their jobs, exhibiting laziness, lacking confidence, having a negative mind-set, experiencing burnout, or simply being unhappy about where they might be in their future lives.

Expected Self. Lastly, the findings associated with the participants’ ideations of the Expected Self illustrate how they envisioned themselves in future work conditions as ultimately being happy with their jobs, maintaining relationships with family and friends, receiving support from their colleagues, being financially stable, managing stress, and sharing their stories to help motivate others. Again, each of these sub-themes consistently emerge throughout the findings as a whole. Therefore, it is evident that the findings in this schema not only encapsulate the participants’ overall thoughts regarding their construction of idealized future work selves, they also affirm which particular components are most essential in shaping their CGS processes.

Relationship of the Findings to Prior Research and Policy

As I mentioned earlier, the findings in this study are consistent with prior research on BWEMs, particularly as it relates to three types of contextual influences that shape their decision-making about careers. For instance, the participants mentioned during the interviews
that receiving support from their parents, interacting with same-race mentors, and finding a major that aligned with their own system of values each contributed to their CGS processes. Not only do these examples illustrate how their experiences correlate with extant literature, they also offer insights that contribute to new knowledge as well.

**Parental Influence/Support**

One aspect of the study’s findings that overlaps with prior research involves the participants’ experiences in relation to parental influence and/or support. Extant literature suggests that BWEMs, like most other women in STEM, are largely influenced by their parents’ or family members’ expectations about which careers they should pursue (Fisher & Padmawidjaja, 1999; McCollum, 1998). This study affirms those claims, as the participants’ initial perceptions about engineering depended on their past experiences and how much they had been exposed to engineering prior to college. For the participants who were knowledgeable about engineering when they began college, they either had parents who were employed in STEM or parents who worked directly with engineers. However, participants from non-STEM or non-engineering households shared that their parents strongly urged them to learn more about engineering professions or to attend engineering summer camps and other pre-college engineering recruitment events.

The literature also points to parental support as a contributor to BWEMs’ academic success in STEM disciplines (Kenny, 1990; Lease & Dahlbeck, 2009). The findings in this study were comparable, as the participants shared that they regularly looked to their families as sources of emotional support to help them persist through the rigors of majoring in engineering. However, one participant felt that her family should have been able to do more than just offer a few general words of encouragement, particularly her parents and older relatives.
Instead, she wished that they could have given her advice about how to establish her professional network and navigate the engineering job market.

**Same-race Role Models**

Another aspect of the findings that overlaps with prior research involves same-race role models. Literature on supportive communities for women and minorities in STEM illuminate how support systems such as mentor networks and peer groups overwhelmingly contribute to the success of BWEMs (Chesler & Chesler, 2002; Downing et al., 2005; Johnson, 2007). The findings also align with this body of work by showing that BWEMs benefit from their interactions with other Black women, especially those who were older and/or in positions of authority.

**Mentor Networks**

Several participants constantly referenced a Black woman graduate student and a Black woman senior faculty member who assisted them through their academic journeys in engineering. As a result of establishing relationships with their same-race mentors, the participants were able to develop a sense of racial identity in addition to their vocational identity as an engineering major, as well as helping to mitigate many of the disparities associated with identifying as racial and gender minorities in engineering (Lent et al., 2005; Walton & Cohen, 2007).

**Peer Groups**

The participants acknowledged that they needed support from their same-race and same-gender classmates, which also overlaps with current literature pertaining to supportive communities for Black women who are enrolled in STEM disciplines (Borum & Walker, 2012; Perna et al., 2009). In addition, they mentioned that talking things out with students who shared
similar backgrounds eased their anxieties about majoring in engineering and helped them gain confidence. These women specifically spoke about the benefits they received as a result of their involvement with entities such as NSBE, the summer transition program and academic support network for minority freshmen engineers, and the living-learning community for women engineers, all of which were sponsored by the MEP office.

**Affinity and Resource Groups**

Despite a reiteration of findings related to same-race mentoring, peer support, and communities that promote the advancement of Black women in STEM, one area of research that needs further exploration involves information about the various employee development opportunities offered by engineering companies such as rotational programs and MRGs (Cropanzano, Slaughter, & Bachiochi, 2005). Three of the participants expressed interests in wanting to become involved with rotational programs, specifically for their mentoring component. One of them also aspired to work as a member of an engineering company’s resource team that was geared toward serving employees from African American, Latinx, LGBTQ, and veteran backgrounds. Therefore, the findings suggest that these types of programs are attractive to BWEMs and provide them with professional communities of support much similar to the ones that were available to them during college.

**Value Systems**

A third and final aspect of the findings that overlaps with prior research on Black women in STEM involves information about the roles that the participants’ value systems played in their CGS processes. More specifically, this study affirms BWEMs’ attachments to societal causes (Johnson, 2005; NACE, 2015; Parham & Austin, 1994) and their family members’ expectations about certain occupations (McCollum, 1998; Whiston & Keller, 2004) and illustrates how both
sets of values influence their career aspirations. However, attachments to social causes are probably the more salient of the two influences, as several participants talked about finding purpose or wanting to improve the lives of others as part of their jobs as future engineers.

**Helping Others**

Several of the participants were making plans to pursue engineering roles that aligned with their attachment to societal causes, which included their compelling interests to assist other people in some type of way. Consequently, *Helping Others* was one of four sets of varying realities that emerged from the *Career Specialty* sub-theme in association with *Professional Aspirations* and the second iteration of *Individualized Clusters* mentioned in Chapter Four. Three participants shared that they wanted to make an impact in this way by either participating with employee education and training activities, improving the quality of life for health care patients, or working on projects that might enhance client safety. As a result of their interests in pursuing a care profession, two of them were actively seeking career opportunities related to biomedical engineering.

**Expectations of Family Members**

In addition to the participants’ interests in helping others, another aspect of the findings that is consistent with prior research on value systems and CGS involves their family members’ expectations about which careers they should consider. As the participants described conversations they had with their parents and other relatives, it became evident that their families for the most part only influenced them to think about professions that they were knowledgeable of or could provide them exposure to. All but one of the participants shared that their parents’ occupations provided them with a sense of trajectory about which careers were realistic for them and which majors they initially considered.
Similarly, the participants’ ethnic backgrounds were also core components of their CGS processes as well. Previous studies include information about the career planning behaviors of Black women in college in relation to collectivist culture (Chaney, Hammond, Betz, & Muton, 2007; Hartung, Fouad, Leong, & Hardin, 2010). However, little is known regarding how those cultural influences affect the way that BWEMs set their career goals. For instance, two of the participants had grandparents who migrated to the U.S. decades earlier, which were important parts of their families’ history and identity. As a result, those students placed an enormous value on education and contributing to their legacy of their family. The participants also emphasized their need to maintain the family structure by either helping out around the house in terms of being able to provide financially for their younger siblings, or living in close proximity to the nucleus to ensure that their relationships continued to stay close-knit.

**Implications for Future Practice, Research, and Policy**

**Practice**

The findings from this study might enhance or affirm various practices used across higher education in the following ways. First, the participants articulated numerous times that they lacked the proper guidance about how they should explore engineering as an occupational choice prior to and throughout college. As a result, several of them were regularly indecisive about which discipline of engineering they should major in or which career field they should actually pursue. Therefore, faculty and administrators who serve in academic advising roles within engineering colleges could be more intentional when assisting BWEMs in their CGS processes by carefully gauging their interests in engineering to help them make informed choices about majors rather than assuming that students will reach those conclusions on their own.
Second, rarely did the participants mention that faculty members engaged them in the types of conversations that helped them determine which engineering disciplines were the best fits for them. Often times, the participants shared that their fellow classmates played more of an integral role in helping them choose a major. Perhaps another strategy for engineering faculty and administrators serving as academic advisors might be to connect BWEMs with suitable upperclassmen mentors of the same race and/or gender who can serve as role models to help guide them in their respective journeys through the rigors of engineering. Furthermore, these findings suggest that there are ample opportunities for educators to incorporate peer mentoring strategies along with delivering a more interactive or conversational approach when offering advisement and helping students select an engineering major.

Third, the participants shared that their involvement in diversity outreach programs hosted by engineering companies as well as the rotational programs associated with internships and co-ops were much more fruitful experiences for them rather than relying on traditional recruitment fairs as a primary means of marketing themselves to employers. They often perceived job fairs as intimidating and thought of themselves as being disadvantaged due to having lower social capital than their non-African American peers as it pertained to professional networking. Industry employers can use these findings to evaluate their recruitment strategies aimed at attracting diverse applicants and to modify their hiring procedures to be more inclusive, so as to not adversely discriminate against individuals from certain racial and/or gender groups such as BWEMs.

Lastly, the participants were eager to offer advice to their fellow BWEMs for generations to come. Although the sub-themes associated with the main theme of Advice to Other BWEMs were individualized, the consensus of the participants’ responses was that they should connect
with others (i.e., peers, mentors, faculty, and student services staff members) for support and advice, doing so early and often. They also urged aspiring BWEMs to remain resilient and to not be discouraged if they have to modify their initial plans or take alternate pathways in pursuit of their engineering degrees. These suggestions are extremely insightful, as they reaffirm that supportive communities are in fact contributors to student success for Black women in STEM disciplines.

This general assessment of the findings associated with Advice to Other BWEMs is also predicated on the experiences of two participants in particular who had critical interventions with upperclassmen at vulnerable points in their college careers, when they were unsure about whether or not they belonged in engineering. These findings provide evidence that BWEMs benefit greatly from peer support systems and thrive in learning environments that embody a collectivistic culture.

Research

In regard to research, the findings either add to or overlap with previous literature on BWEMs in a variety of ways. For instance, this study examines the CGS processes of BWEMs on the brink of completing their undergraduate degrees in engineering and transitioning into the industry workforce. In addition to these efforts, scholars might extend or conduct another study to include their experiences as new professionals. This type of research is already being explored regularly by professional engineering associations (PEAs) such as NSBE and the Society of Women Engineers (Rincon & Yates, 2018). Therefore, one of the first discoveries I would look forward to in future works involves finding out which of the participants’ specific possible selves are realized and what modifications they make to their CGS processes once they
become professional engineers. Data from those findings could provide information about how BWEMs advance their possible selves or set career goals after graduating from college.

Another aspect related to the findings that needs examining involves prior research on topics such as perseverance and resilience. Duckworth and colleagues (2007) posit that “perseverance and passion for long-term goals,” and “working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress” are necessary for any individual to achieve academic and/or professional success (pp. 1087-1088). Similarly, Yeager and Dweck (2012) described resilience as “any behavioral, attributional, or emotional response to an academic or social challenge that is positive and beneficial for development (such as seeking new strategies, putting forth greater effort, or solving conflicts peacefully)” (p. 303). The participants certainly epitomized both of these attributes according to their comments about their CGS processes, as they shared how they had struggled to become engineering majors, cope with academic stress, find their sense of belonging in engineering, decide which fields of engineering they wanted to specialize in, and secure opportunities for employment or graduate school after college.

Despite having encountered numerous adversities along the way, the findings illustrate ways in which the participants prevailed by changing their academic plans, making adjustments, or exploring new strategies that would help them ultimately reach their goal of successfully earning an engineering degree respectively.

Along with perseverance and resilience, the concept of growth mind-set also emerged in the findings and needs to be examined further as well. Growth mind-set stems from resilience and also focuses on applied effort and finding alternative ways to achieve success, as well as the consideration of new learning experiences as opportunities for improvement (Dweck, 2010;
Yeager & Dweck, 2012). Several of the participants expressed having learned from past mistakes and other setbacks, and that they wanted to build on those experiences by using them as cumulative efforts that would help them achieve their career goals.

In a future study, it might also be appropriate to use other conceptual frames such as perseverance, resilience, and/or growth mind-set in addition to possible selves when examining BWEMs’ CGS processes. Not only would this type of research expound on what scholars know about how BWEMs construct their future work selves, it would help to clarify what specific adjustments they make to their CGS processes (i.e., changes in self-regulatory behaviors, identity formation – possible selves schema, and mental simulation) when encountering adversities.

On a similar note, it might be prudent to conduct another study including participants who are enrolled in engineering programs at PWIs in comparison to participants who are enrolled in engineering programs at HBCUs. By diversifying the institutional sample, scholars would be able to examine the participants’ experiences across multiple campus environments, which shape the developmental contexts that ultimately influence their CGS processes. In addition, this type of study might also provide deeper insights regarding how and when BWEMs embody attributes such as perseverance, resilience, and/or growth mind-set when responding to adverse situations in various academic settings.

One last aspect regarding the study’s findings that contributes to the literature involves the transferability of the research topic, which might be expanded to include participants of varying racial or cultural identities with interests in different academic disciplines as well. For instance, further studies could be conducted to examine the CGS processes of students from other underrepresented backgrounds who are enrolled in STEM disciplines such as Hispanic women in mathematics or Black men in medicine. Findings from those works could enhance the
scholarship surrounding possible selves, particularly the relationship between how one’s individual and contextual factors and their intersecting identities of race/ethnicity and gender affect the way they construct an idealized career self.

**Policy**

In terms of future work, there are several areas of policy that could benefit from the study’s findings. First, two participants admitted that they knew little about engineering prior to attending college, which hindered them from connecting with engineering and being successful in their respective majors earlier in their college careers. In response to these findings, state governing boards could enhance policies designed to create pathways in K-12 education as well as opportunities in postsecondary education for exposure to engineering careers, particularly those geared toward African Americans and women. Continuing to modify policies like these could help elevate math and science proficiency for students from the aforementioned populations at earlier grade school levels, which contribute to their success in STEM disciplines as supported by the literature.

Second, the participants constantly expressed how much they benefitted from various engineering companies’ diversity outreach programs and rotational/co-op programs, which they attributed to helping them increase their overall knowledge about engineering careers and the types of tasks or projects that certain jobs entailed. Those opportunities provided participants with real-world experiences, specialized training, and professional communities of support that inspired them to keep pursuing their career goals in engineering. As a result, career services directors should explore avenues for establishing formal agreements with PEAs that are widely known for promoting inclusive hiring practices and/or featuring employee development programs for underrepresented minorities (Cropanzano et al., 2005; Rincon & Yates, 2018).
This study’s findings might inform administrators and industry employers in their efforts to create these types of workforce alliances, which often serve as necessary policy drivers for ensuring that successful college-to-career pathways exist for women of color in STEM.

Lastly, the participants were extremely cognizant of the workplace culture and overall climate of their potential places of employment, as well as the demographics of the surrounding communities where they are located. Companies with base work sites near metropolitan centers or more progressive areas of the U.S. were favored by the women in the study, as were employers that featured various MRGs as options for their employees’ development. Taking that into consideration, engineering companies and employment agencies should become more aware of the contextual factors that attract or deter BWEMs regarding their organizations. The findings create a foundation for future studies that might expand practice, research, and policy related to strategies that promote communities of support for women and minorities in STEM fields.

**Limitations of the Study**

Although the findings generated from this study are of significant value, there are also several limitations that must be considered as well. First, all of the participants in the study were enrolled at a single research intensive PWI, which means that the data is only reflective of a select group of BWEMs at that institution. Therefore, the findings may not be transferable to the experiences of all BWEMs, particularly during their senior year of enrollment. If the sample had included participants from various engineering programs at different universities, then the conditions influencing their respective journeys might have been comparable. For instance, the caliber of the participants’ engineering programs may vary in the types of partnerships their institutions have with engineering companies, which might influence their relationships with potential recruiters or employers.
Next, only five BWEMs agreed to participate in the study, which was below the initial targeted sample size of eight participants. Despite remaining within the suggested threshold of participants for a credible phenomenological study, a larger sample might have allowed for a more robust generation of data and perhaps a greater variety of themes or clusters. However, limits in participation may have been unavoidable largely due to the low numbers of BWEMs who were enrolled as seniors regardless of the institution, as well as their lack of availability during the final semesters of their undergraduate careers.

Another area of limitation involves the timeframe when data were collected. During the interviews, several participants shared that they were concerned with completing various tasks associated with finishing college and starting their careers such as taking exams, preparing for graduation, searching for full-time jobs and/or securing an assistantship if they planned to attend graduate school. As I mentioned in Chapter Three, I intentionally wanted to avoid those activities and other major events (i.e., fall break, spring break, NSBE regional meeting and national convention dates) when recruiting participants. However, due to unexpected challenges when implementing the research schedule, I was forced to solicit participants’ involvement during times that conflicted with the aforementioned events, which may have competed with some of their larger priorities.

Conclusion

In closing, I would like to emphasize five main points regarding my dissertation based on the explication of data and contexts of literature against which I have chosen to postulate my study. The first point is derived from the synopsis of the findings from the discussions section, which suggests that the CGS processes of the participants in this study encompassed a series of cognitive steps that they employed throughout their experiences as BWEMs. In other words,
CGS is essentially the byproduct of several concurrent processes that work together concomitantly while BWEMs engage in their respective career searches. Some of the factors that influenced the phenomenon in this study include the participants’ thoughts about goal-setting in general, exploring engineering careers, making adjustments academically, finding an area of career specialization, and dealing with anxiety related to the challenges they encountered as engineering majors.

Of the factors that influenced the participants’ CGS process, I also made an interesting discovery regarding their general thoughts about setting goals. Initially, I assumed that seniors on the brink of graduation would be implementing some type of structured plan for achieving their career goals. However, I learned firsthand that this was not necessarily true, as some participants were more inclined than others to set goals. A couple of them were extremely focused when it came to career goal-setting and even shared detailed strategies about how they planned to achieve them (i.e., write down specific goals, make mini-goals, create an action plan, evaluate progress and set additional goals, etc.). On the contrary, besides earning their engineering degrees, there were other participants who had not given much thought to setting professional goals.

The second point involves the study’s affirmation of what previous research has already revealed about how undergraduate engineering programs that feature communities of support contribute to BWEMs’ academic success. However, the findings suggest that communities of support are also attractive to BWEMs in professional settings as well, as several participants gravitated toward engineering companies with rotational programs, MRGs, and/or reputations for promoting employees from underrepresented backgrounds into leadership roles.
The third point relates to support systems and highlights the participants’ need to maintain relationships with their relatives and friends while transitioning into the engineering workforce. This theme was prevalent throughout the study and aligns with theories surrounding collectivist culture (Oyserman & Lee, 2008; Robinson & Betz, 2008). Furthermore, it clearly illustrates how BWEMs regularly fuse their personal goals and professional goals together when engaging in CGS, which influenced several other factors in their planning processes. As a result, the participants considered careers or employment positions that could provide them with opportunities to live in close proximity to their families, help them financially, or start families of their own. However, despite this tendency to converge their goals, the participants never seemed to allow their personal expectations to supersede their career ambitions. They essentially wanted to be successful at both, but not at the expense of one for the other if at all possible.

The fourth point is probably the most notable, as it uncovers how BWEMs deal with anxiety at various times throughout their CGS processes. As I mentioned in an earlier summary of the findings, expressions of anxiety were recurring factors that appeared in every analytical category. More specifically, the participants felt stressed in various ways whenever they encountered difficulties around making decisions about their majors, getting through the engineering coursework, developing an attachment to engineering, figuring out which jobs would be right for them, establishing professional networks, and managing uncertainty related to their career search. As a strategy for reducing these anxieties, participants pursued internships and co-ops, which served as reprieves from the academic demands of majoring in engineering. In addition, they looked to graduate schools and engineering rotational programs as post-graduate alternatives to finding permanent or full-time employment.
Another remedy for managing the stressful conditions associated with the participant’s experiences as BWEMs entails their desire to specialize in certain fields of engineering. This may stem from their earlier challenges with finding some sort of passion for engineering. The participants navigated these concerns by developing their own attachments to specific fields within engineering and choosing to pursue employment positions that they felt personally connected to. Consequently, several of them picked occupations that would allow them to help others (i.e., biomedical engineering, pharmaceutical research, leadership and management roles, working with MRGs and employee development programs, etc.).

The fifth and final point is related to the conceptual frames of sense of belonging and vocational identity. I chose not to include either of them in the previous sections about the findings in regard to prior research or implications for future research. Nevertheless, it is quite possible that those frameworks could have been incorporated into this study as theoretical underpinnings. The most obvious area of the findings that connects to sense of belonging theory pertains to the sub-theme Belonging in Engineering (via Becoming an Engineering Major). However, the applicability of this frame also emerged in a more implied manner throughout the remainder of the findings, particularly as it relates to the sub-themes associated with Social Contexts (i.e., Need for Peer Support, Interactions with Mentors, LLC Involvement, and MEP Office). Similarly, vocational identity seems to relate to the sub-themes Deciding What to Do and Specializing (via Professional Goals), and Career Specialty (via Professional Aspirations) associated with the Individualized Clusters. All of these findings consist of the participants’ comments regarding their interest in potential engineering roles that aligned with either their personal values or a particular social cause they felt connected to.
Finally, despite an overabundance of statistical analyses regarding the disproportionately low numbers of Black women in engineering, little is known about why their representation is so limited. Perhaps this is because scholars have not truly examined their specific experiences in engineering from a phenomenological perspective, particularly as it relates to CGS. Therefore, this study points optimistically in a new and refreshing direction. Hopefully, as a result of sharing this work with researchers, faculty and administrators, and policy makers, they will then have a greater understanding about what BWEMs experience as they prepare to enter the engineering workforce. By design, the study’s findings may not be transferable across the experiences of all BWEMs. However, they do provide insights regarding CGS and possible selves that have not yet been considered. These points of knowledge might be useful for industry employers and educators alike, especially those who are charged with developing recruitment and mentoring strategies that specifically target students from underrepresented backgrounds who are interested in pursuing STEM careers. The findings strongly suggest that BWEMs desperately need gatekeepers to guide and assist them in their processes of transitioning into the professional world. Therefore, this work affirms prior understanding that communities of support are vital contributors to BWEMs’ academic success, and furthermore, adds that professional communities of support are just as valuable in the cause to help Black women advance in engineering.
References


Quinn, R., & Spreitzer, G. (1997). The road to empowerment: Seven questions every leader should consider. *Organizational Dynamics, 26*(2), 37–49.


identities motivate proactive career behaviors. *Journal of Applied Psychology, 97*(3),
580-598.


Vocational Behavior, 16*, 282-298.

L. Brooks (Eds.), *Career choice and development* (2nd ed., pp. 197-261). San Francisco:

*Paths to knowledge: Innovative research methods for nursing* (pp. 97-105). New York,

26(4), 383-406.

Tate, E. D., & Linn, M. C. (2005). How does identity shape the experiences of women of color
engineering students? *Journal of Science Education and Technology, 14*(5-6), 483-493.

https://timesupnow.org/work/equity/

ethnicity to female engineering students’ educational experiences and college and career


Appendix A

Participant Recruitment Email

REQUEST FOR PARTICIPATION

Greetings,

You have received this letter because you have been identified as a potential candidate for a qualitative study titled: The Career Goal-Setting Processes of Black Woman Engineering Majors.

As an African American woman who is majoring in engineering, your thoughts and comments are extremely valuable in helping to understand your experiences as they relate to career goal-setting while pursuing professional employment opportunities. At this time, I am seeking volunteers to participate in two interviews, both of which will be approximately 60-minutes in length. The interviews will be audio-recorded and transcribed for analysis, and are part of a dissertation study that I plan to submit for the completion of my doctoral degree.

In appreciation for your time, you will receive a $15 gift card at the end of each interview. If you are interested and would like to participate in the study, please review the purpose statement below and complete the informed consent form (attached). Also, feel free to contact me with any questions or concerns. Thank you for your consideration, and I eagerly await your response!

Respectfully,
Adrien DeLoach
Doctoral Candidate/Researcher
Virginia Tech
(979) 218-9025 (cell)
adeloach@vt.edu

Research Purpose

This study will explore the career goal-setting processes of Black woman engineering majors. By interviewing African American women who are U.S. citizens, enrolled in an engineering program during their senior year, and searching for employment in engineering fields outside of higher education, I am hoping to explain the specific steps they take when planning for their future lives as professional engineers. Additionally, I will examine how Black woman engineering majors’ past experiences and social and developmental backgrounds influence the way they set career goals. Ultimately, I anticipate that the findings of this study will encourage college administrators, industry employers, and policymakers to modify practices and procedures that enhance conditions for African American women across the various fields of engineering.
Appendix B

Prescreening Questionnaire

The Career Goal-Setting Processes of Black Woman Engineering Majors

Participant Questionnaire

Thank you for interest in this study. Please respond to the following questions:

1. What is your first and last name?

2. What is your email address?

3. What is your daytime phone number?

4. What is your date of birth (month/day/year)?

5. What is your academic classification (i.e. freshman, sophomore, junior, or senior)?

6. What is your anticipated graduation date (month/year)?
7. What is your academic major? (i.e. civil, mechanical, industrial, biomedical engineering, etc.) Also include any additional majors or minors.

8. What types of engineering jobs are you most interested in?

9. How would you describe yourself with regard to each of the following characteristics (also known as social identities)? I am asking these questions because I want to be inclusive in this study. You may skip any question you would prefer not to answer.

   Gender: 

   Race: (i.e. Black, Hispanic, Asian, Native American/Amerindian, Caucasian, biracial, etc.)

   Ethnicity: (i.e. African American, Ghanaian, Jamaican, Haitian, Puerto Rican, Nigerian, etc.)

   National origin: (Please indicate whether you are a U.S. resident or an international student.)
What other roles, identities, and experiences are most important to you? (You can list anything you like, but some examples could be: being the first in your family to attend college, socioeconomic background, ability/disability, being in a fraternity/sorority, religious affiliation, sexual orientation, etc.)

10. Please choose an alternate first name you would like to use as a pseudonym for this study.

Thank you! Please return this completed questionnaire to adeloch@vt.edu.
Appendix C

Non-Participant Email

Greetings,

You are receiving this message because you were not selected as a participant for the qualitative study titled: The Career Goal-Setting Processes of Black Woman Engineering Majors. As a result of your responses during the pre-screening process, you did not meet all of the selection criteria. Nevertheless, I still would like to thank you for your time and willingness to participate in the study. I also wish you the best of luck throughout the remainder of your senior year and with your job search!

Respectfully,

Adrien DeLoach
Doctoral Candidate/Researcher
Virginia Tech
Appendix D

Informed Consent Form

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Participants
in Research Projects Involving Human Subjects

The Career Goal-Setting Processes of Black Woman Engineering Majors

Principal Investigator: Claire K. Robbins, Ph.D.

Additional Investigators: Adrien DeLoach

I. Purpose of this Research Project

This study is being conducted by one doctoral candidate (hereafter, “the researcher”) as partial fulfillment of his dissertation requirements. The researcher is being supervised by a faculty committee chaired by Dr. Claire Robbins, Assistant Professor of Higher Education.

The purpose of this study is to understand how Black woman engineering majors construct idealized selves as part of their career goal-setting processes. The researcher seeks to recruit African American women (ages 20 to 24) who are U.S. citizens, currently enrolled in their final year of baccalaureate study in an engineering program at a historically Black college or university, and searching for employment in fields of engineering outside of academia to participate in this study. The researcher is seeking individuals to participate in two interviews. The findings of this study will be submitted to the faculty committee for completion of the researcher’s degree of doctor of philosophy in higher education.

II. Procedures

Should you choose to participate, you will be asked to complete a demographic questionnaire (which will take approximately 15 minutes) and two 60 to 90-minute, audio-recorded, face-to-face interviews with the researcher. Face-to-face, audio-recorded interviews will take place in an academic building on campus or other safe location agreeable to both participant and researcher that allows for confidential data collection. Each interview will last between 60 and 90 minutes. All interviews will be audio-recorded and transcribed to ensure accuracy in the collection of participants’ responses.

Finally, participants will be invited to review and comment on a brief summary of the findings to confirm that the researcher has accurately understood participants’ perspectives.

III. Risks

The researcher is not aware of any physical, legal, or dignity risks should you decide to
participate in this study. However, because social and developmental experiences related to one’s career goals can be sensitive topics, some participants may experience minor emotional discomfort as a result of interviews.

Although the researcher will take every precaution to protect the confidentiality of participants, the primary risk associated with this study is a breach of confidentiality with regard to sensitive information about participants’ identities or experiences. If linked to individual participants and shared with participants’ peers, administrators, or faculty, colleagues, or students, such information could create discomfort and lead to negative social or academic consequences if those who received this information chose to act unethically and penalize students for what they shared during interviews. Should participants need to seek treatment after the interview, any costs associated are the responsibility of the subject, not the research project, the researcher, the researcher’s supervising faculty member (Principal Investigator), the researcher’s supervising faculty committee, or Virginia Tech.

IV. Benefits

The primary anticipated benefit of this study is to increase scholarship and the body of literature surrounding the experiences of Black woman engineering majors who are pursuing employment in fields of engineering outside of academia. By participating in this study, participants may experience meaningful insights about their career goals and provide helpful information that may help guide future educators working with students in similar situations. No promise or guarantee of benefits has been made to encourage participation.

V. Extent of Anonymity and Confidentiality

If, at any time, a participant in this study discloses information to the researcher that raises concern about the imminent health or safety of any person(s), the researcher may report this information to appropriate authorities.

Otherwise, the researcher pledges not to share any identifying information about participants or interviews with anyone other than the supervising faculty member (Principal Investigator).

Those who are selected to participate in the study will select their own pseudonyms on the demographic questionnaire. This demographic questionnaire will be stored separately from the transcripts and any other study materials to ensure privacy. All interviews will be audio-recorded and transcribed. Participants’ real names will not be included in transcripts. Only pseudonyms will be used in transcripts.

Transcripts will serve as the primary sources of data. Electronic copies of transcripts will be kept by the researcher for data analysis. Demographic forms will be kept separate from the transcripts and any other study materials. All electronic data will be password-protected and stored on Dropbox. Only the researcher will have access to the data.

In all publications and presentations connected with this project, participants’ identities will be protected to the maximum extent possible through pseudonyms and the removal of any
potentially identifying information about participants and anyone associated with them.

Virginia Tech (VT) Institutional Review Board (IRB) may view the study’s data for auditing purposes. The IRB is responsible for the oversight of the protection of human subjects involved in research.

VI. Compensation

Compensation in the form of two $15 Visa gift cards will be offered in exchange for subjects’ participation in this study. A gift card will be presented to participants at the end of each interview.

VII. Freedom to Withdraw

You are free to withdraw from this study at any time with no consequences, and you may decline responding to any question at your discretion.

Please note that there may be circumstances under which the researcher or supervising faculty member may determine that a subject should not continue as a participant.

VIII. Subject’s Responsibilities

I voluntarily agree to participate in this study. I have the following responsibilities:

- Complete a demographic questionnaire.
- Participate in two 60 to 90-minute face-to-face interviews.
- Review and comment on a summary of findings.

IX. Subject’s Permission

I have read the Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

_______________________________________________ Date__________
Subject signature

_______________________________________________ __________________________
Subject printed name

Should I have any pertinent questions about this research study, I may contact directly:

Adrien DeLoach
Doctoral Candidate
adeloach@vt.edu
(979) 218-9025
Investigator/Primary Contact
For questions concerning the study conduct, research subjects’ rights, and whom to contact in the event of a research-related injury, please notify:

David M. Moore, Ph.D.
Chair, Virginia Tech Institutional Review Board
for the Protection of Human Subjects
Office of Research Compliance
moored@vt.edu
(540) 231-4991
Appendix E

Projection Exercise

Possible Selves

In preparation for the first interview, please review the following paragraph:

“Probably everyone thinks about the future to some extent. When doing so, we usually think about the kinds of experiences that are in store for us and the kinds of people we might possibly become. Sometimes we think about what we will probably be like, other times about the ways we are afraid we might turn out to be, and at other times what we hope or wish we would be like. One way of thinking about this is to talk about possible selves. We can probably imagine a number of possible selves in terms of the kind of people we might become, the way we might feel, or the actions we might take. Some of these possible selves are similar to the way we are now or almost surely will be, and some may be only vague thoughts or dreams about the future.” (Markus, 1987)

Now think about how you would describe your possible selves, particularly as they relate to your future career goals. During the interview, please come prepared to share any thoughts or comments you have as a result of reading this paragraph.
Appendix F

Interview Protocol

The Career Goal-Setting Processes of Black Woman Engineering Majors

Interview Protocol – Interview #1

Introduction

1. How has your week been so far?
2. What are some of the things that you are working on/looking forward to this week?

Thank you for meeting with me today and agreeing to talk. I have a few questions to guide our discussion about your experiences related to setting career goals. Throughout the time we are talking, please be as detailed or as expressive as you feel comfortable. Also, if you think of any issues or situations that my questions fail to address though you feel are relevant, feel free to share those experiences as well.

Past Experiences – Social Contexts

3. Tell me about your past life, up to the time you became an engineering student, going back as far as possible.
4. How have your experiences with family members, friends, teachers, people in your community, etc. shaped your career goals?

Past Experiences – Developmental Contexts

5. How did you become an engineering major? Talk about several events in your past that have influenced your career goals.

Possible Selves

6. After reading the handout about possible selves, ask participants:
   a. Who do you expect to become in the next five years?

Closing

7. Is there anything else you would like to share about your experiences related to setting career goals?

Thank you for your time today. I really appreciate the valuable insights you have shared. Before you go, I would like to schedule a date and time either later this week or next week for us to continue this discussion.

   Day(s): [ ] Time(s): [ ]

Does this day and time work for you, or do you have any other preferences? Thanks again, I will send you a confirmation of the location via email.
Interview Protocol – Interview #2

Introduction

1. How has everything been since we last talked? Tell me about it.

Once again, thanks for meeting with me. I have a few more questions to ask you regarding your experiences related to setting career goals. As with our last interview, please be as detailed or as expressive as you feel comfortable. Also, if you think of any issues or situations that my questions fail to address though you feel are relevant, feel free to share those experiences as well.

Present Experiences – Developmental Contexts

2. When we last talked, I asked who you expect to become in the next five years. Tell me more about who you imagine you will be when you are 25-29 years old by describing what you think your (possible-self) future career-self will be like at that age?

3. With this in mind, what are you currently doing or planning to reach the career goals you have? Please be as detailed as possible.

Present Experiences – Social Contexts

4. How are your family, friends, faculty/administrators, or professional mentors, etc. currently helping you to reach these goals?
   a. What are they specifically doing or planning to help you?

Overall Experience

5. Given what you have said about your life before you became an engineering student and what you are currently doing to reach your career goals, how do you understand career goal-setting in your life?
   a. What does this (career goal-setting) process mean to you?

6. What about this experience matters most to you?

7. Given what you have reconstructed about your life experiences in both interviews (past and present), tell me about the possible selves you think will be true for you in the next five years? (hoped for, avoided, expected)

Closing

8. Is there anything else you would like to share about your experiences related to setting career goals?

Thanks again for your time today. I really appreciate everything you have shared in both interviews. In the next couple of weeks, I will transcribe and summarize each of your interviews. After which, I will email you a copy of those summarized transcripts for you to review, make any modifications, and send back to me.
Appendix G

IRB Approvals

March 2, 2018

Claire Kathleen Robbins
robbinsc@vt.edu

Dear Dr. Robbins:

RE: Protocol Submission for WIRB Review

The Virginia Tech IRB office has screened this study and determined that it is ready for WIRB review:

VT IRB #: 18-012
Title: The Career Goal-Setting Processes of Black Woman Engineering Majors
Federal Funding, ID: Unfunded

Please go to https://connexus.wirb.com to complete the protocol submission process to the IRB.

Sincerely,

Suzie Lee, Ph.D.
Interim Chair, Virginia Tech IRB
Claire K. Robbins, PhD
Virginia Polytechnic Institute and State University (Virginia Tech)
1750 Kraft Drive
Corporate Research Center, Room 2015
Blacksburg, Virginia 24060

Dear Dr. Robbins:

SUBJECT: REGULATORY OPINION—IRB EXEMPTION
Protocol Title: The Career Goal-Setting Processes of Black Woman Engineering Majors
Investigator: Claire K. Robbins, PhD

This letter is in response to your request to Western Institutional Review Board (WIRB) for an exemption determination for the above-referenced research project. WIRB’s IRB Affairs Department reviewed the exemption criteria under 45 CFR §46.101(b)(2):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
   (i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects’ responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, or reputation.

We believe that the research fits the above exemption criteria. The data will be collected in a way so that the subjects can be identified, directly or through identifiers linked to the participants. However, any disclosure of the human subjects’ responses outside the research will not reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, or reputation.
This exemption determination can apply to multiple sites, but it does not apply to any institution that has an institutional policy of requiring an entity other than WIRB (such as an internal IRB) to make exemption determinations. WIRB cannot provide an exemption that overrides the jurisdiction of a local IRB or other institutional mechanism for determining exemptions. You are responsible for ensuring that each site to which this exemption applies can and will accept WIRB’s exemption decision.

Please note that any future changes to the project may affect its exempt status, and you may want to contact WIRB about the effect these changes may have on the exemption status before implementing them. WIRB does not impose an expiration date on its IRB exemption determinations.

If you have any questions, or if we can be of further assistance, please contact Currien MacDonald, M.D., C.I.P., at 360-252-2889, or e-mail RegulatoryAffairs@wirb.com.

CM:ds
B2-Exemption-Robbins (03-08-2018)
cc: Jennifer Farmer, Virginia Tech
    WIRB Accounting
    WIRB Work Order #1-1068276-1
Greetings,

I’d like to thank you for completing the interviews and sharing your experiences as a Black woman engineering major. As promised, based on your responses to the interview questions, I created a summary for each of your interviews. At this time, I would like for you to review those summaries to ensure that your perspective on the career goal-setting process is accurately reflected. Please carefully check over the attached files, making changes or corrections as necessary, and return those revisions back to me within the next seven days. If I do not hear from you after seven days have passed, I will assume you have no changes or corrections.

Thanks again for agreeing to serve as a participant for the qualitative study titled: The Career Goal-Setting Processes of Black Woman Engineering Majors. I wish you the best of luck throughout the remainder of your senior year and with your job search!

Respectfully,

Adrien DeLoach
Doctoral Candidate/Researcher
Virginia Tech