WOMEN OF COLOR FACULTY IN STEM: SUCCESSFULLY NAVIGATING THE PROMOTION AND TENURE PROCESS

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ABSTRACT

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Black women and Hispanic/Latina faculty are underrepresented in tenured science, technology, engineering, and mathematics (STEM) positions at research universities. Despite this fact, this demographic group is increasingly recognized at the national level as a key source of underutilized talent that may significantly contribute to the nations' STEM talent pool. As a result, resources continue to be allocated to higher education institutions to support the successful career advancement of women of color in STEM. Yet, little empirical data currently exists about how these faculty members successfully navigate the promotion and tenure process based on the salient challenges they face as probationary faculty.

The purpose of this study is to investigate the factors that contribute to the successful career advancement of tenured Black women and Hispanic/Latina STEM faculty from *assistant to associate* professors at predominately White, research institutions. A sub-focus of this study is to identify the challenges faced by the participants during their early career.

This qualitative study is guided by social cognitive theory and the literature on faculty development. A purposeful snowball sampling technique (n=13) is utilized. Respondents filled out an online demographic questionnaire and participated in one round of telephone interviews (90-120 minutes). The findings show that the participants faced five key challenges as probationary, early career faculty. Seven personal and external strategies enabled the participants to mitigate these challenges and contributed to their successful promotion and tenure. Suggestions for future research and implications for policy and practice are presented.

I dedicate this dissertation to my family. Thank you for cheerleading, for listening, for encouraging, and most of all, for keeping it real.

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PREFACE

The underrepresentation of tenured Black women and Hispanic/Latina faculty in the fields of science, technology, engineering, and mathematics (STEM) at public, predominately White research universities is well documented. Women of color, in particular, cite additional obstacles beyond those reported for junior faculty and women in academia, such as cultural taxation, tokenism, and an overload of service requests. Despite this, however, a small but growing number have achieved promotion and tenure in these fields. Knowledge about how or why the few tenured Black women and Hispanic/Latina faculty have successfully advanced in their careers is limited.

In this study, I focused on individuals who achieved tenure in environments where teaching, research, and service are typically expected and where grant and publication success are major currencies. I examined what contributed to the successful advancement of their faculty careers from assistant to associate status, from the perspective of the women faculty themselves. Specifically, I investigated the strategies that Black women and Hispanic/Latina STEM faculty used to overcome personal, organizational, and disciplinary-related challenges amidst the promotion and tenure process. Furthermore, I explored the factors that enabled them to persist through these challenges.

I conducted my study in four key ways. First, I identified what type of challenges these professors encountered during their probationary years. Next, I inquired about the strategies they enlisted to navigate those challenges. Third, I explored the factors that influenced their persistence to tenure. Finally, I aggregated the acquired data to characterize what contributed to the successful advancement of their faculty careers.

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KEY TO ABBREVIATIONS

STEM: science, technology, engineering, mathematics

PWI: predominately White institutions

CHAPTER 1: INTRODUCTION

Background and Problem Statement

Research universities—uniquely positioned to contribute significantly to research and innovation in the fields of science, technology, engineering, and mathematics (STEM) (Etzkowitz & Leydesdorff, 2000), and where much talent exists—continue to struggle to achieve full representation of women of color faculty (Ong, Wright, Espinosa, & Orfield, 2010; Towns, 2010; Turner, González, & Wong (Lau), 2011). Fortunately, over the last 30 years, a small but growing number of ethnic and racially-underrepresented women have begun to access professorships and make headway into academic STEM careers (Ong et al., 2010).

There has also been a marked national increase in recognizing Black and Hispanic/Latina women scientists and engineers as a major source of untapped talent and human capital that can serve to strengthen and sustain the economic vitality of the US (CEOSE, 2011). As a result, increasing the representation of women—and particularly women of color—in these fields has become a national priority as evidenced by policy and research funding initiatives sponsored by the federal government, non-profit organizations, and higher education institutions.

For example, at the national level, the National Science Foundation (NSF) ADVANCE initiative has committed over $135 million since 2001 in an effort to increase the representation of White women and women of color at all faculty rank levels in the STEM fields (Chubin, DePass, & Blockus, 2009; NSF, n.d.). Further, the Association of American Colleges and Universities (AAC&U), a national association comprised of 1,300 accredited public and private colleges, universities, and community colleges around the country, announced the application opening for their 2012-2013 *Preparing Critical Faculty for the Future* cohort. The AAC&U was "looking for institutions whose leaders are committed to fostering leadership and professional

development among faculty women of color" (AAC&U, 2012, para. 1) in science and engineering or in social and behavioral science.

Higher education institutions have also increased awareness of the continued need to support women of color in these academic fields. For example, the Harvard Educational Review (HER) committed its 2011 Summer Symposium Issue, *Unraveling the Double Bind: Women of Color in STEM* , to highlight the changing environment for ethnic and racially-underrepresented science and engineering women faculty since 1976 (Anonymous, 2011). These examples illustrate that resources are being committed to foster the career success of women of color faculty in these technical and academic arenas.

The financial, political, and personal undertaking that will ensure advancement of this demographic group requires an understanding of the factors lead to their success amidst the promotion and tenure process. Yet, according to Ong et al.(2010), who synthesized research literature produced between 1970 and 2008 on the career stages of STEM women of color, there is "little empirical research on the career success of women of color in STEM fields exclusively" (p. 35). Further, what body of literature exists on the careers of STEM women of color faculty lacks in-depth qualitative analysis (Ong et al., 2010).

Broadly speaking, what *is* known about some of the difficulties that most junior faculty struggle with in their path toward tenure are issues such as a perceived lack of community and time management conflicts (Gappa, Austin, & Trice, 2007). Matters related to the tenure process, such as how promotion and tenure committees define and weigh productivity, are also issues that probationary faculty struggle with (Gappa et al., 2007).

For junior faculty in the STEM fields, additional obstacles such as fierce competition for, and high expectation to obtain, significant and constant levels of grant funding adds further

pressure (Anderson, Ronning, De Vries, & Martinson, 2007). Women, especially women in STEM, encounter the additional challenges of implicit bias, unequal access to resources in the workplace (such as lab space), and for some, concerns about the interaction of childbearing periods with pressures from the tenure clock (Burrelli, 2008; Gappa et al., 2007; Rosser & O'Neil Lane, 2002).

Faculty of color across disciplines cite additional barriers beyond those described above. These often include cultural taxation, "a term used to describe the expectation placed on faculty of color to handle minority affairs" (Padilla, 1994, p.26); tokenism—a term that describes the isolating feelings of belonging to a "society of one" (Essien, 2003, p.64) as the sole person of color in a department; and the psychological stress of code switching—a term that describes the application of "parts of their separate value system to different situtations as appropriate" (Sadao, 2003, p. 410).

For women faculty of color specifically, navigating through the promotion and tenure process often paints an even greater complex scenario. Malcom, Hall, and Brown (1975) brought national attention to the "double bind" faced by women of color who exist at the intersections of race and gender. In the landmark American Association for the Advancement of Science (AAAS) report, *The Double Bind: The Price of Being a Minority Women in Science,* the authors argued that there is greater taxation for women of color who pursue academic science than for men of color or for White women due to experiencing racism and sexism simultaneously.

We know that the literature has documented many of the challenges and some success strategies (e.g., adopting professional attitudes, developing conceptual understanding of the work place, participating effectively through shared governance) for junior faculty and women in

academia (Austin, Sorcinelli, & McDaniels, 2007; Gappa et al., 2007; Stanley, 2006). For faculty of color, success strategies often address faculty of color and women of color as a homogenous group, and the foci typically emphasizes approaches to 'survival' in the academy at-large. These strategies seldom differentiate approaches by faculty rank, disciplinary area, or institution type.

It is still an open question as to the particular personal, organizational, and disciplinary-related barriers for women of color junior faculty *in STEM* as they *seek to achieve promotion and tenure* from assistant to associate rank status. The literature remains sparse in answering questions of how junior Black women and Hispanic/Latina STEM faculty successfully navigate tenure given the particular challenges they face amidst the promotion and tenure process at predominately White, research university settings. For example, does living at the intersection of race, gender, and science require strategies or actions that go beyond what is already reported for junior faculty and for women in academia?

It is imperative to demystify the factors that lead to success if we aim to provide optimal work environments necessary needed to support the creative talents of all American faculties. Despite the lack of extensive research on the success strategies utilized by tenured women of color STEM faculty, significant undertakings and financial resources continue to be allocated at national, institutional, and individual levels to ensure their support and rank advancement (CEOSE, 2011; NSF, 2012a).

Research concerning women of color STEM faculty who achieve tenure at predominately White, research universities can provide knowledge of the actions that facilitate their achievement of tenure while living at the intersection of race, gender, and science. Thus, from the perspectives of these faculty members, I focused on investigating why and how they

successfully navigated through the challenges they encountered along the promotion and tenure process, and what factors ultimately contributed to their success.

Definition of Terms

In this study, I used terms that may be defined in several ways. This section provides key terminologies and the corresponding definitions used in the context of this study.

Junior Faculty

The term *junior faculty* was used to indicate the probationary status of academic professors with the rank of assistant professor in a full-time, tenure-track position. The term junior faculty was used interchangeably with the following terms: assistant professor, early career faculty, and probationary faculty.

Promotion and Tenure / Career Advancement

Promotion was viewed as the reward for meeting set criteria that result in faculty rank advancement. Tenure was viewed as the institution's desire to have a lifelong relationship with the faculty member. Some institutions award tenure with promotion, for others these are two distinct outcomes. This study assumed promotion *with* tenure in its use of the term *promotion and tenure,* or simply *tenure,* unless otherwise indicated (see chapter three, limitations section, p. 97 to read about the exceptions to this definition). The term "career advancement" was used synonymously with promotion and tenure from assistant to associate rank status in the study context.

Tenured Faculty

In this study, *tenured faculty* designated those that advanced from untenured junior standing to tenured associate standing. In the case of tenured full professors who participated in this study, the discussion of "achieving promotion and tenure" was limited to their specific

career stage experience of the tenure and promotion process from assistant to associate rank only.

STEM

The term *STEM* was used to indicate fields of study in academic science, technology, engineering, and mathematics disciplines. *Science* included any discipline or sub-discipline of physical and life sciences only. Medical, social and behavioral, and economic sciences were not included in this study. *Technology* included the field of computer sciences. *Engineering* included all branches of engineering with the exception of engineering education. *Mathematics* encompassed both pure and applied fields of study.

Women of Color

In this study, the term *women of color* indicated U.S. citizens (domestic born or naturalized citizens) or permanent residents who self-identified as Black and/or Hispanic/Latina. Any/all ethnicities within these wider racial categories were included.

Underrepresented Women Faculty in STEM

According to NSF, the term *underrepresented minority* refers to Hispanics, Native Americans, and Blacks—the three racial and ethnic groups "whose representation in science and engineering is smaller than their representation in the U.S. population" (NSF, 2011). In this study, the phrase *underrepresented women* faculty in STEM referred to this definition (Native Americans were not sampled in this study). I included the term Latina in addition to Hispanic.

Research Universities (RU/VH and RU/H)

The term *research universities* were used to denote doctoral granting institutions with research activity. This study emphasized those classified as RU/VH, followed by RU/H. Carnegie Classification of Institutions of Higher Education (2010) defines these terms as,

RU/VH: Research Universities (very high research activity) and *RU/H: Research Universities (high research activity).*

Predominantly White Institution (PWI)

This term is used to define higher education institutions "whose student populations have historically been White and whose student populations remain predominantly White" (Brower & Ketterhagen, 2004).

Research Question

In this study, I addressed the following question: What contributes to the successful career advancement of women of color faculty in the fields of academic science, technology, engineering, and math? My sub-questions are:

a) What strategies did tenured Hispanic/Latina and Black women faculty in the STEM fields enlist to successfully overcome personal, organizational, and disciplinary-related challenges amidst the early career promotion and tenure process?

b) What factors enabled them to persist through these challenges?

Purpose of Study

The primary purpose of this study was to extend current knowledge about how and why Black women and Hispanic/Latina STEM faculty successfully achieved tenure given the particular challenges they faced, and to learn more about the factors that led them to persist through the junior phase of their faculty careers. At a time where there is high demand for but limited understanding of this particular demographic group, much foundational knowledge must still be developed to ensure that practices and policies cultivate effective and supportive work environments that contribute to success in the promotion and tenure process for all faculty in these fields.

Significance of Study

There are several important reasons for studying the strategies that contributed to the career advancement of faculty women of color in these fields. First, the fields of science, technology, engineering, and mathematics play a vital role in advancing the competitiveness of the US in a time of changing national context and increasing global competition. In today's knowledge-intensive economies, STEM research and development has come to be viewed as integral to economic and social growth through research innovation and its commercial exploitation in the form of new technology, goods, and services (NSB, 2010a). At a time when the US has experienced gradual erosion in its global leadership position, continued investment in US science and engineering research, development, and its workforce capital is critically important (Committee on Prospering in the Global Economy, 2007).

Furthermore, the current US STEM workforce "continues to rely heavily on attracting foreign-born scientists and engineers" (NSB, 2010b, p. 10). A great need exists to develop a stronger pool of available US talent for purposes of scientific discovery and technical innovation (CEOSE, 2011; Committee on Prospering in the Global Economy, 2007). Hispanic women represented the largest group of resident minority women in 2008 (NSF, 2011), and "the Black alone population had the third-largest numeric increase in population size" from 2000-2010 (US Census Bureau, 2010a, p. 5). In this time frame, "the only major race group to experience a decrease in its proportion of the total population was the White alone population" (US Census Bureau, 2010a, p. 5). Additionally, women currently make up slightly over half of the US population (US Census Bureau, 2010b, p. 2), and by 2050, ethnic minorities are projected to constitute about half of the US population. Furthermore, Hispanics will contribute to the greatest growth in addition to Asians (NSF, 2011). As a result, Black and Hispanic women have been

identified by the US government as key agents in fulfilling the country's need for diverse talent in STEM fields.

In order to remain competitive now and into the future, the US must "draw on the minds and talents of all Americans, including minorities who are underrepresented in S&E [science and engineering] and currently embody a vastly underused resource and a lost opportunity for meeting our nation's technology needs" (NRC, 2011, p. 2). Moreover, this dynamic comes at a time when the US is expecting a growing retirement wave in the science and engineering workforce, which is currently comprised of mostly White males (Chubin et al., 2005; Millett & Nettles, 2006). Thus, this study is important because it offers recommendations that promote the success of an important demographic group that contributes to national excellence in these critical areas.

Also, as previously noted, millions of dollars have already been authorized for purposes of supporting and advancing women of color STEM faculty in the academy. However, given that actual data on successful women of color faculty are scarce, one can assume that most programs and initiatives to support their advancement have been drawn at least in part on methods based mainly on anecdotal examples. It is imperative to move beyond belief, to identify key elements that lead to optimizing conditions that support the success of women of color STEM faculty through rigorous research.

Fourth, aspiring and current junior faculty, practitioners, and researchers may benefit from the results generated by this study. Current and future assistant-level STEM women of color faculty may find the results of this study insightful in guiding or planning their own careers. Additionally, investigators concerned about the careers of faculty generally, or women faculty and faculty of color specifically, may find this study contributes to the advancement of

their own research agendas. University staff and administrators who seek to allocate tight budgets cost-effectively or who are developing support programs may also be interested in these findings by way of implementing action plans using evidence based solutions. At minimum, the results of this study will contribute to conversations pertaining to an important area that is relatively unexplored.

Finally, the long standing underrepresentation of STEM Black women and Hispanic/Latina faculty raises concerns of equity in educational and employment systems in the US (Ong, Wright, Espinosa & Orfield, 2011). Despite the inroads, Black and Hispanic/Latina women have been historically and consistently underrepresented in the professoriate and virtually non-existent in tenured STEM positions at research universities for decades (Ong et al., 2010; Towns, 2010). This study also contributes modestly towards ameliorating the disparity that exists between women of color and their better-represented White female and minority male colleagues in these fields by highlighting strategies that have fostered the success of those who participated in this study.

Taken together, the dynamics of the national and academic contexts result in a pressing need to look at the ways in which women of color STEM faculty, particularly Black women and Hispanic/Latina, are successfully navigating the promotion and tenure process. I believe it is critical to move beyond the question of "why so few" and instead forward the dialogue to focus more closely on why the few women of color in these tenured positions are, in fact, in place. Without consistent research efforts that focus on what works by those who have been successful, it is likely that the academy may continue to struggle with effectively supporting Black women and Hispanic/Latina STEM faculty who seek to advance their careers from assistant to tenured associate professor status.

CHAPTER 2: LITERATURE REVIEW

Chapter one illustrated that women of color are a growing demographic group whose contributions to academic STEM are increasingly sought after at national and local levels. Yet, higher education institutions continue to struggle to achieve full representation of women of color faculty in these disciplinary areas. In order to understand how and why the few women of color in these tenured positions are, in fact, in place, it is necessary to understand the multiple contexts in which they live and work.

Six broad frames were explored to make up my literature review. First, I reviewed the literature on the general nature of tenure-track faculty careers. Second, I highlighted the primary challenges typically faced by new faculty during the probationary stage as cited in the faculty development literature. The third frame I touched on was the obstacles that disproportionately affect faculty who are in the STEM disciplines. Fourth, I outlined the circumstances that many tenure-track women in the academy must navigate through, especially women in STEM. The fifth work context reviewed here included the barriers reported by faculty of color in academe. I concluded this chapter by highlighting strategies thought to support the success of early career faculty, and to the extent possible, junior faculty women and women of color in STEM. A summary of this literature review is included at the end of this chapter. First, I turn to the literature on the nature of tenure-track faculty careers.

Faculty Career Development

Despite the variety of academic appointment types, such as part-time and adjunct positions, the tenure-track model remains the standard employment model for the academic profession and continues to play an essential role in US institutions of higher education (Gappa et al., 2007). Tenure-track positions comprise three main levels or stages: assistant professor,

associate professor, and full professor. Each of these career stages are characterized by different needs and opportunities.

Baldwin and Blackburn (1981) further divide the three main stages into five sub-categories:

> I. assistant professors in the first three years of full-time teaching, II. assistant professors with more than three years of college teaching experience, III. associate professors, IV. full professors more than five years from retirement, and V. full professors within five years of formal retirement. (p. 601)

Although some aspects of the faculty career, such as heavy workload demands, are present across all stages, Baldwin and Blackburn (1981) noted that academic careers are more appropriately described as "evolving," "fluctuating," and involve "critical events" (p. 603) across the three stages, and five sub-categories.

In addition to the evolving nature of academic careers, the manner in which a tenure-track assistant professor applies for promotion to associate professor and tenure, and the manner in which reappointment, tenure, and promotion (RTP) committees weigh their teaching, research, and service criteria, vary from rank to rank and from institution to institution. Although the performance criteria that enable tenure-track faculty to advance from one rank to the next is typically based on teaching, research, and service (Luchs, Seymoure, & Smith, n.d.), each institution weighs these factors differently. For example, tenure expectations at colleges with a strong emphasis on undergraduate teaching, such as liberal arts colleges, are likely to differ to some degree from the expectations at a large research intensive university (Austin & Rice, 1998).

Variation in requirements, expectations, and RTP outcomes also exists among the same institutional types, such as from one research intensive university to another (Fairweather &

Beach, 2002). Further, some institutions award tenure with promotion, yet others consider promotion and tenure as two distinct outcomes (Edmondson, 2012). Typically, promotion is viewed as the reward for meeting set criteria, whereas the granting of tenure generally reflects the institution's desire to have a lifelong relationship with the faculty member (Diamantes, 2002).

Differences in tenure expectations are not only based on institutional types, but also vary according to disciplinary contexts (Austin & McDaniels, 2006; Austin & Rice, 1998; Fairweather, 2002). Bronstein and Ramaley (2002) explain that:

> If you are in a scientific field, you may be expected to begin applying for external funding, and receiving funding may be an important factor in the ultimate tenure decision. If you are in humanities, you may be expected to publish your dissertation as a book. For many fields, ongoing publication in refereed journals is the primary indicator of scholarship. (p. 38)

Additionally, factors such as mission, philosophy, norms, and values play a role in what is expected of faculty members as they seek promotion and tenure (Austin & McDaniels, 2006). Although it is true that many departments and institutions have specific standards regarding qualifications for tenure, except at junior colleges, by and large, faculty are rewarded more highly for research than for teaching or service, even though teaching effectiveness is often a close second (Fairweather, 1993; Green, 2008; Luchs et al., n.d.), especially at research-intensive universities (Bronstein & Ramaley, 2002).

In sum, the course of tenure-track faculty careers can be understood to develop over time and across a number of distinct stages. The expectations of teaching, research, and service can vary depending upon institution(s) and discipline(s), but typically these responsibilities make up

the major requirement areas for promotion and tenure. The nature of tenure-track faculty careers is the first setting which must be taken into consideration to understand the context in which STEM women of color faculty work. The second setting that must be understood are the challenges typically encountered by junior faculty during the first six years of their tenure-track careers. These initial six years comprise the probationary junior faculty stage, the career-stage focus of this study.

Early Career Faculty

Challenges

Early career faculty face three primary challenges during their probationary period: negotiating the expectations and requirements of the tenure process itself, building collegial communities, and effectively managing a heavy workload with limited time (Gappa et al., 2007; Rice, Sorcinelli, & Austin, 2000; Tierney & Bensimon, 1996). Work-life balance is also cited in the literature as an issue faced by many junior faculty. However, because work-life balance is an issue that is reported to differentially affect women faculty and their career advancement, I have categorized it in the *Women Faculty in STEM* section below. Additionally, stress has been consistently reported to increase dramatically during the first five years of appointment for probationary faculty (Austin et al., 2007; Menges, 1999; Olsen, 1993).

Tenure process. Problems frequently cited by junior faculty include vague or unclear written expectations of the requirements necessary to achieve tenure; ambiguous, unwritten, unspoken, or implicit performance criteria; and, conflicting departmental versus institutional messages (Austin & Rice, 1998; Gappa, et al., 2007). Junior faculty frequently struggle with various aspects of the tenure-track process itself, particularly the expectations for performance. In a study that focused specifically on the challenges and needs that junior faculty face, Austin

and Rice (1998) found that faculty are expected to fulfill a variety of roles, such as being a student adviser and committee member. One faculty in their study commented:

> … but it is not clear how much is expected, if one is free to decline, what the penalty would be if one did decline, and how these activities are taken into account when one is assessed for tenure. (Austin & Rice, 1998, p. 741)

Further, faculty have noted the "additive" nature of their work over the last decade. That is, they are being given an increasing number of responsibilities and duties compared to the expectations of when their senior colleagues were in their position (Austin et al., 2007). Faculty are increasingly being asked to engage in more entrepreneurial activities, control costs, increase productivity, and become literate in new technologies (Austin & McDaniels, 2006). Taken together, unclear expectations, conflicting messages, and the additive nature of faculty work result in uncertainty in regard to where junior faculty should engage in the most effort.

Feedback on their performance is another area in which junior faculty express concern. Performance feedback from members of promotion and tenure committees, chairs, deans, and senior colleagues have been described as "insufficient, unfocused, and unclear" (Austin et al., 2007, p. 59). Several studies have found that there is a lack of clear conversation about the expectations for junior faculty (Austin et al., 2007; Menges, 1999; Rice & Sorcinelli, 2002; Trower, 2005).

Early career faculty have also expressed concern that their senior faculty colleagues, upon whom they are dependent to provide feedback and evaluation, "may not be sufficiently knowledgeable in new research areas to judge the work of their newer colleagues fairly and appropriately" (Austin et al., 2007, p. 59). In some cases, the uncertainties in performance and evaluation of the tenure system are leading probationary faculty "to choose topics based on the

speed with which these topics can be addressed or on the degree to which the topics are likely to be attractive to more senior colleagues who sit on the tenure and promotion committees" (Austin & Rice, 1998, p. 748). As a result, this can lead to the crippling of promising ideas and research pursuits by junior faculty.

At times, junior faculty also struggle with the tenure evaluation process. These reasons are due to "frequently rotating chairs, turnover in the membership of personnel committees, and closed committee meetings, which surround tenure deliberations and the values that inform them with uncertainty and often secrecy" (Austin et al., 2007, p. 60). The problems that arise from these reasons include changing expectations and lack of transparency. To help ease the stress of the tenure process, junior faculty seek more consistency and transparency in the review process.

Fairweather (2002) explains that the values of those involved in the review process come into play when forming judgments—a legitimate concern of probationary faculty. "Whether explicitly or not, the evaluation of faculty performance incorporates *values* about the relative importance of faculty work and unit goals" (Fairweather, 2002, p. 101). Particularly important to evaluation is the distinction between "goal clarification and the measurement of performance, on the one hand, and assigning value to distinct aspects of a faculty member's performance in an RPT decision, on the other" (Fairweather, 2002, p. 97).

Mawdsley (1999) reports that in the tenure review process, a calibrated scale that precisely determines the fit of a junior member into the future of an academic unit does not exist. Boice (1992) notes that junior faculty often find themselves in the position of having to discern the relative importance of criteria on their own, which makes for "an inefficient trial-and-error process with no guarantee that junior faculty will 'get it right'" (Fairweather, 2002, pp. 101-102).

Certainly, not every early career faculty member struggles with the tenure-track process; however, these are common challenges reported by probationary faculty.

Building collegial communities. Developing collegial relations, particularly for probationary faculty, is critical because in academic life certain intangibles such as "collegiality," "fitting in," "being a team player," and "being a good citizen" are part of the RPT evaluation process (Bronstein & Ramaley, 2002, p. 38). Although the weight given to collegiality in RPT decisions is a subject of debate (Hatfield, 2006), probationary faculty should attend to both stated and unstated requirements for advancement (Bronstein & Ramaley, 2002).

Mitchell and Miller (2011) noted that for faculty who are being judged, it is imperative to develop social connections. In this regard, collegiality has been described as the "fourth unofficial area evaluated in granting tenure" (Mitchell & Miller, 2011, p. 203). Collegiality is also important because "universities must rely on academic governance for the cooperative and corporate action of its faculty" (Mawdsely, 1999, p. 173). A breakdown in communication or mutual respect within faculty governance can negatively impact a university at a larger scale. Thus, a strong collegial community and network of peers is critically important at both an individual level and in terms of the broader tenure process and institution.

Collegiality is an important aspect of the career trajectories of junior faculty because it plays an important role in forming professional and community connections, such as with mentoring and networking opportunities. Junior faculty, however, frequently assert that mentoring and guidance are not easy to find (Austin et al., 2007). The lack of such opportunities is one reason that early career faculty experience a diminished sense of collegiality and community (Austin et al., 2007; Sorcinelli & Yun, 2007).

As a result of these challenges, in general, early career faculty describe their tenure-track journey as filled with "isolation, fragmentation, loneliness, competition, and occasionally incivility" (Gappa et al., 2007, p. 78). Studies based on the experiences of early career faculty point to a strong need for more effective connections among early career and senior faculty.

Workload and time. Studies have consistently identified time as a limiting factor and fundamental problem that affects the ability for junior faculty to successfully meet the multiple demands of faculty life (Austin et al., 2007; Boice, 1992; Fink 1984; Luce & Murray, 1998; Whitt, 1991). In addition to conducting research, producing scholarly work, obtaining grants, keeping up with the discipline, and attending to the demands placed by ones family or personal life, faculty must also negotiate their schedules to accommodate a variety of requests and expectations. This includes requests to participate in service activities and student advising; they must allow time for classroom preparation that will address diverse learner needs and result in effective teaching and learning environments, and take time to learn and incorporate technology into classroom settings in this digital age (Gappa et al., 2007; Hamlin, Marcucci & Wenning, 2000; Olsen, 1993; Solem & Foote, 2004).

Further, junior faculty report difficulty in knowing how to split the time that *is* available amongst competing work requirements. For instance, even though teaching a full course load necessitates a significant amount of effort and attention, there is incongruence in compensation between the rewards for teaching versus research, particularly at research-intensive universities (Austin et al., 2007). By year five, junior faculty typically report increased personal comfort with their research agendas and with teaching compared to junior faculty in year one on the tenure-track (Olsen, 1993; Olsen & Crawford, 1998; Olsen & Sorcinelli, 1992). Despite this,

satisfaction continues to decline for many early career faculty with respect to finding enough time to balance the conflicting demands of teaching, research, and service (Austin et al., 2007).

To summarize, the key points mentioned in this section described the common challenges faced by probationary faculty during the early career stage: matters related to the tenure process itself (e.g., vague tenure requirements, unclear work performance feedback), building collegial communities (e.g., difficulty in accessing mentors and building a network of peers), and difficulty managing a heavy workload with limited time (e.g., competing demands, negotiating schedules, splitting available time). Thus, up to this point I have introduced two contexts in which early career STEM women of color carry out their faculty careers.

The first context, which relates to all early career faculty, is executing the required and expected institutional and disciplinary teaching, research and service items necessary to achieve promotion and tenure. The second context relates to navigating through three obstacle areas commonly reported by probationary faculty—managing workload and time, building collegial communities, and maneuvering through often vague tenure process expectations. The third context that further shapes the environment where women of color establish their academic faculty careers is specific to those in the academic fields of STEM.

Faculty in STEM

Challenges

Early career faculty in STEM face an additional set of challenges beyond what has been described above. These obstacles are related to technical infrastructure, grant and publishing pressures, and issues related to scientific culture itself.

Infrastructure. Obtaining proper laboratory space, appropriate equipment, and materials to conduct research are of special concern to early career STEM faculty, particularly for physical

and life scientists, and engineers. Science and engineering research frequently requires wet or dry lab space and sophisticated equipment and technology. Early career science and engineering faculty need equipment and instruments available to them from the time they arrive on campus. Nevertheless, such faculty have reported "that too much time is lost waiting for equipment to be purchased and installed" (Austin & Rice, 1998, p. 744). Meeting the tenure timeline may become problematic when an institution cannot ensure that newly hired faculty have the instruments, equipment, technology, or laboratory space needed to conduct their research in a timely way (Austin & Rice, 1998; Austin et al., 2007).

Grant and publishing pressure. Additionally, the pressure to obtain grants and to publish articles is particularly heightened for early career faculty in science and engineering. In a study on the effects of competition on work and relationships, Anderson et al., (2007) interviewed 51 early- and mid-career academic science faculty. The authors found that it was "clearly the drive for publications and grants that foster[ed] the greatest competitive pressure" (p. 443). Anderson et al., (2007) presented study participant excerpts such as this comment from a physicist: "You've got to have a billion publications in my field. That is the bottom line. That's the only thing that counts. You can fail to do everything else as long as you have lots and lots of papers" (p. 443). Another participant commented: "If you need one more grant to solidify your rank and tenure package, you may [need to] violate your personal integrity" (Anderson et al., 2007, p. 456).

Clearly, there is a strong expectation to obtain a constant and significant level of grant money to fund research activities (Anderson et al., 2007) and to publish for faculty in these fields. This poses a special challenge for many early career faculty in STEM due to the decreasing funding opportunities for scientific research and the fierce competition for it. Further,

particularly unique to science and engineering disciplines, a candidate's grant attainment levels and publication record are of central importance in promotion and tenure decisions.

Anderson et al. (2007) also described the "gaming aspect of the grant and publication system" (p. 447). The authors explained that academic science faculty are particularly subjected to gaming the system "in order to get funded" (Anderson et al., 2007, p. 447), even if this means "portray[ing] their areas of expertise in ways that match calls for proposals" (p. 447). In reference to particular scientists at their institution, one early career faculty member in Anderson et al.'s (2007) study stated, "They're really a breast cancer researcher, but they go after the prostate money because that's where [the funding] is at. And they don't have the theoretical knowledge and skills, but they end up going down that path" (p. 447).

Goodstein (2002) asserts that the state of scientific affairs has changed dramatically, noting that it once was an intellectual competition but "has become an intense struggle for scarce resources" (p. 31). In fact, although the federal government has been the primary source of research and development funding for over 50 years, the discussions to reduce the national deficit in light of the current constrained budget leaves the future of research and development growth uncertain (NSF, 2012b). Compared to 30 years ago, science now operates increasingly as a corporate sector. During this time frame, "science has increasingly come to reflect the assumptions, tools, methods, and products of modern-day-market capitalism, a political and economic system driven by competition" (Anderson et al., 2007, p. 458).

Culture. The competitive culture of STEM causes distinct challenges for faculty. Anderson et al. (2007) stated:

> Competition contribute[s] to strategic game-playing in science, a decline in free and open sharing of information and methods, sabotage of others' ability to use one's work,

> interference with peer-review processes, deformation of relationships, and careless or questionable research conduct. (p. 437)

Furthermore, Blumenthal et al. (2006) found that competition drives many academic life scientists to maintain trade secrets, delay publications to protect the commercial value of findings, or withhold information from a manuscript so as to protect one's scientific lead.

As a result of this highly competitive culture, the building of collegial relations can be especially difficult. The National Research Council (as cited in the Institute of Medicine, 2002) noted: "Because science is a cumulative, interconnected, and competitive enterprise, with tensions among the various societies in which research is conducted, now more than ever researchers must balance collaboration and collegiality with competition and secrecy" (p. 25). Anderson et al. (2007) stated, "Competition among scientists for funding, positions and prestige...is often seen as a salutary driving force in U.S. science. Its effects on scientists, their work and their relationship are seldom considered" (p. 437).

In addition to heightened competitiveness, the culture and climate of academic science and engineering remains overwhelmingly Euro-centric and Western in values, and masculine in norms and expectations (Ong, 2005; Xu & Martin, 2011). Although gender and racial/ethnic representation in these fields has increased over the last 30-40 years (Ong et al., 2010; 2011), implicit bias and unequal access to resources against women and faculty of color remains (Burrelli, 2008; Gappa et al., 2007; Georgi, 2000; Gibson, 2003; Margolis & Fisher, 2002; Ong, 2005; Ong et al., 2010; 2011; Rosser & O'Neil Lane, 2002).

Thus, in addition to the two contexts highlighted earlier in this literature review, early career women of color faculty in STEM must also handle challenges unique to those who develop academic careers in these disciplinary areas. The matters reviewed in this section were

related to infrastructure needs, the heighted grant attainment and publishing pressure placed upon academic scientists and engineers, and aspects associated with scientific culture and climate. The following section introduces a fourth context in which early career women of color faculty operate and develop their academic careers—that related to gender, and gender and science in the academy. I begin the following section with a brief overview of the progress women have made in entering these fields over recent decades.

Women Faculty in STEM

Women have made significant progress in their representation of faculty who are in academic science, technology, engineering, and mathematics. In *Thirty-Three Years of Women in S&E Faculty Positions*, Burrelli (2008) highlights that women's share of full-time tenured or tenure-track positions in science and engineering has increased to 26% in 2006 compared to just 10% in 1979. Women's representation at the full professor rank has also improved, from 5% in 1973 to 19% in 2006. But, compared to men in these fields, academic women continue to "hold a larger share of instructor and assistant professor positions (42%) than of associate (34%) or full professor (19%) positions" (Burrelli, 2008, p. 5).

Challenges

Despite progress, research on women in STEM consistently indicates three primary barriers to their career advancement—the need to balance career and family, and a lack of professional networks (Rosser & Taylor, 2009). The challenges associated with dual-career partnerships are also particularly relevant for many academic women scientists.

Work-life balance. Work-life balance is the ability to manage one's professional and personal life in a harmonious manner. However, the often rigid and inflexible tenure-track structure reflects remnants of its origins—a career structure established by and for male faculty

(Gappa & MacDermid, 1997). Gappa et al. (2007) explained that in today's academic work environment, two adults who work outside of the home has replaced the model of the 'ideal worker' (typically a male with a spouse at home to manage domestic and personal responsibilities).

Today, many male and female faculty members are in households where each adult is expected to balance both work and domestic responsibilities (Gappa et al., 2007). For example, this may include "being a spouse, a parent, a child of aging parents, [and] an involved citizen" (Austin et al., 2007, p. 67). As a result, stress is compounded on new faculty due to these competing demands, and considerable strain can result for those academics that are a part of dual working partnerships (Gappa & MacDermid, 1997; Austin et al., 2007). Work-family conflicts are often exacerbated for probationary faculty. That is, compared to associate and full professors, there are considerably more reports of "negative spillover" of professional work into home life for early career faculty (Oslen, 1993; Sorcinelli & Near, 1989).

The need to balance career and family affects both men and women faculty in all disciplinary areas. Unfortunately, the decision to form a family comes at a greater professional cost to women compared to male faculty in the academy. Women often cannot afford to delay decisions about childbearing until after their careers have been well established. As a result, the need to meet significant tenure expectations within a strict time frame affects women disproportionately because their peak childbearing years most often coincide with the probationary period of tenure-track careers (Ceci & Williams, 2007; Handelsman et al., 2005; Rosser, 2004). Using data from the National Science Foundation Surveys on Doctoral Recipients, from the period of 1979 to 1995, Mason and Goulden (2002) found that male faculty members who started families within five years of receiving their Ph.D.s were 38% more likely

to earn tenure than women who do the same. Only one out of three women who began a tenure-track position at an elite or research university *before* having a child ever became a mother (Mason & Goulden, 2002).

For women in STEM in particular, studies have revealed that work-life balance obstacles are especially salient. Using both qualitative and quantitative data, Rosser (2004) found that 70% of the 450 academic women scientist and engineer respondents in her study cited the most significant challenge to their professional advancement as the need to balance career and family. In another study that used 17 nationally representative data sets, Xie and Shauman (2005) found that career advancement was slowed down for academic women scientists with preschool-aged children due to the cited need to balance work and family responsibilities; however, this was not the case for their male counterparts.

Reasons that compound the obstacles for women faculty to balance career and family, especially for women in STEM, are related to socially constructed gender schemas and work-place structures. For example, academia still "largely remain[s] structured around a traditionally hierarchical, male workplace model and culture" (Schlehofer, 2012, p. 112), particularly in science and engineering domains. For instance, the mythical model that "ideal scientists give priority to work, has [*sic*] few outside interests or responsibilities, and pursues research single mindedly" (Fox, Fonseca, & Bao, 2011, p. 717) is outdated, but persistent in science and engineering work culture. Furthermore, women faculty in STEM, and women faculty broadly, must often compete on uneven ground because many institutional policies do not address the practical parameters faced by all of their academic employees who are on the tenure-track. Rosser and Taylor (2009) noted that, compared to other countries, "Scientists in the United States have few federal and institutional supports for childbearing and rearing, such as paid leave

for both mothers and fathers, on-site day care, and the mandatory holding of academic positions while faculty take leave" (para. 17). This statement also reflects current policies at many public and private research institutions.

Additionally, socially ascribed gender roles related to domestic work and care-giving exacerbate the challenges of work-family balance for women. Although men increasingly share household and care-giving responsibilities, the "lion's share" in both of these domains continues to fall on women (Nelson-Gray, 2012; Schiebinger & Gilmartin, 2010). Despite considerable career gains in recent decades, this gender schema is no exception for women in science. In a study conducted by Schiebinger and Gilmartin (2010), who examined housework and women at thirteen elite US research universities, the author's found that there is still a traditional division of household labor. Schiebinger and Gilmartin (2010) stated:

> Female scientists do nearly twice as much housework as their male counterparts. Partnered women scientists at places like Stanford University do 54 percent of the cooking, cleaning, and laundry in their households; partnered men scientists do just 28 percent. This translates to more than ten hours a week for women— in addition to the nearly sixty hours a week they are already working as scientists—and to just five hours for men. (para. 2)

Schiebinger and Gilmartin (2010) argued that U.S. society has witnessed only "half of a revolution" (para. 22) with respect to high-caliber academic women in science and engineering. In their study, they illustrated that housework is an academic issue because these extra hours per week have consequences for the academic careers of women, including their ability to successfully meet tenure-track expectations. In addition to the need to balance career and family

as a prominent issue for women faculty in STEM, developing and maintaining professional networks is another major barrier for this demographic group.

Professional networks. Female faculty in STEM "report fewer referrals from collegial networks to participate in the commercial marketplace by being asked to consult, serve on science advisory boards, and interact with industry" (Rosser & Taylor, 2009, para. 21). Further, although evidence suggests that both formal and informal mentoring practices that provide resources and information access are effective in propelling faculty careers (Gorman, Durmowicz, Roskes, & Slattery, 2010; Karukstis, Gourley, Wright, & Rossi, 2010), women tend to lack mentors and role models, inhibiting their advancement (Bhatia & Amati, 2010; Rosser & Taylor, 2009). Bhatia and Amati (2010) stated:

> There are too few female role models for junior faculty members of the engineering community. Engineering is a particularly taxing field. Without support and guidance from other women, at both the junior and senior levels, women may find engineering to be an inhospitable discipline. (para. 10)

In regard to the closely-related field of academic medical science, Blood et al. (2012) found: "Of the 1179 women faculty who responded, 54% had a mentor, and 72% without a mentor desired mentoring. The most important mentor characteristic identified was availability" (p. 1).

Additionally, female STEM faculty are often confronted with overt or subtle harassment, sexual discrimination, implicit bias, exclusion from research collaborations and leadership roles, isolation, exclusion from decision-making roles, and a climate that is often experienced as unwelcoming, or "chilly" (Bode, 1999; Bystydzienski & Bird, 2006; Ceci & Williams, 2011; Hill, Corbett, & Rose, 2010; Liang & Bilimoria, 2007; Rosser, 2004; Settles, Cortina, Stewart, & Maley, 2007). All of these factors affect women scientists' and engineers' ability to build

collegial relationships and community. As a result, this may directly or indirectly impact their willingness or capacity to develop solid professional networks in this male-dominated arena.

Dual-career couples. Beyond the difficulties related to building professional networks and work-life balance, dual-career dynamics is another important challenge faced by women in STEM. According to Schiebinger et al. (2008), 83% of female scientists have academic partners who are also scientists, while this is the case for only 54% of male academic scientists. In such partnerships, especially if the partners are in the same field, dual-career issues, including obtaining tenure-track positions for their spouses or partners at the same institution, are magnified (Rosser & Taylor, 2009).

The multiple contexts that have been presented thus far—fulfilling explicit and implicit teaching, research, and service responsibilities required of all early career faculty; handling three common obstacle areas faced by probationary faculty; managing factors that are unique to faculty in academic STEM disciplines; and developing a faculty career in a largely gendered domestic and professional society—create many challenges that can cause women faculty in science and engineering to leave academia prematurely (Anderson et al., 2007; Austin et al., 2007; Mason & Goulden, 2002; Rosser, 2004; Rosser & Taylor, 2009). Nevertheless, these circumstances provide the layered framework in which STEM women of color develop and advance their faculty careers. Furthermore, these interlocking elements play out in particular ways for women of color. In order to fully grasp the work-environment of this demographic group, it is also necessary to introduce a fifth context, that is, the experiences of faculty of color and women of color at predominately White institutions.

Faculty of Color

A unique set of factors— bicultural stress, tokenism, microaggressions, and stereotype threat—frequently shape the experiences of early career scholars of color in academe (Jean-Marie & Lloyd-Jones, 2011; Stanley, 2006). Due to these encounters, many faculty of color have attributed these factors as reasons that result in their experiencing poor or even hostile work climates.

It is important to reiterate that much of the current literature that focuses on the challenges of faculty of color often homogenize their experience. To be explicit, most bodies of current literature excessively frame faculty who are women and men belonging to non-White racial and ethnic groups as a single entity who often share a common experience. A body of literature that identifies the barriers and challenges of faculty of color disaggregated by gender, disciplinary area, institution type, and faculty rank is underdeveloped.

When faculty of color *are* differentiated by gender (consistent with the growing body of literature on women of color), the experiences, challenges, and voices of 'women of color' faculty are also typically amalgamated so as to misleadingly over-represent a common experience for women faculty who are not of White racial or ethnic backgrounds. Currently, a limited body of knowledge exists about the nuanced experiences of Black and Hispanic/Latina (as well as Asian and Native American) women faculty according to rank status, institution type, and disciplinary area. The value of disaggregating data collected on women and women of color, however, is increasingly recognized. These limitations may include a reduced understanding of exact circumstances that may result in inadequate solutions.

Given these constraints, by default, I also introduce these shortcomings into my literature review, particularly that of not knowing the relevance of some of the barriers described below

for certain faculty of color over others (e.g., pending rank, institution type, discipline etc.). Currently, much of what is written on this topic focuses on the experiences of faculty of color at predominately White institutions over other institution types. Also, though many published works include the experiences of faculty of color across rank, a common alternative is to focus on early career faculty. For these reasons, I note that the challenges reviewed in this section and in the following section are "broadly" experienced by early career faculty of color at predominately White institutions. I have excluded the phrase "early career" from the formal headers in these sections due to these limitations. It is important to point to the limitations that exist in utilizing the term *women of color* or *faculty of color* and recognize that there are likely distinctions in the experiences of these individuals introduced by race/ethnicity, gender, disciplinary area, institution type, and faculty rank status.

Despite this, however, the information that has been disseminated is undoubtedly useful. For example, the common themes that manifest across the faculty of color literature, such as tokenism, are of value and provide insight to wider phenomena. Also, the need for use of umbrella terms, such as *faculty of color* or *women of color*, can be useful or necessary in a variety of circumstances, for example in collective agenda efforts. Below, I highlight the unique challenges experienced by faculty of color, followed by women of color faculty. I begin by defining the terms bicultural stress, tokenism, microaggressions, and stereotype threat. I also outline how these factors affect scholars of color in the work-place and elicit why, if present, can contribute to an unwelcoming academic work-place environment for this demographic group.

Challenges

Bicultural stress. The term bicultural means *two cultures,* and it does not necessarily subsume biracial (Sadao, 2003). Individuals who are bicultural identify with at least two distinct

cultures, are aware of their membership (or outside status) of these different cultures, and have access to two or more cultural knowledge traditions that stem behavioral responses (Brannen & Thomas, 2010; Hong et al., 2000). Biculturalism, then, is the achievement of functioning between and within two or more cultures.

Broadly, biculturalism has been written about in two ways—as a positive skill set that leads to a reduction of culturally-related stressors (e.g., linguistic, relational, discriminatory, cultural isolation) (Cheng & Lee, 2009), and as a stressful and taxing experience. Cheng and Lee (2009) suggest that the level of identity integration predicts these outcomes. My focus will be on bicultural stress because that is the theme dominantly reported in the higher education faculty of color literature.

Bicultural stress refers to the psychological stress that a person of one culture may suffer by virtue of having to coexist (e.g., live and work) with people of a different cultural background while still upholding his or her own identity (e.g., language, communication style, epistemology). The stress arises from feeling compelled to suppress or diminish a part of one's identity (Edmondson, 2012; Sadao, 2003; Scheurich & Young, 1997). Scheurich and Young (1997) contend that faculty of color are at a severe disadvantage compared to White faculty because they must "become epistemologically bi-cultural to survive as scholars" (p. 9). Sadao (2003) noted that faculty of color, to fit into predominantly White institutions, commonly experience bicultural stress.

Edmondson (2012), who studied Black faculty who underwent the tenure and promotion process, found that they felt they must take on White norms and values while maintaining their own culture in their community when moving from one cultural context to another—such as from community and family to a separate dominant academic culture. To maintain a bicultural

identity, many faculty of color resort to code switching—"applying parts of their separate value systems to different situations as appropriate" (Stanley, 2006, p. 7). According to Stanley (2006), "Living in two worlds and the energy expended in code switching can take its toll on any individual's psyche. In many instances, it leads to occupational stress" (p. 7).

Such a daily balancing act detracts from the career experiences of faculty of color at predominantly White institutions. Biculturalism must be negotiated along with the additive demands of early-career faculty and those reported by women academics, especially women in STEM. The experience of bicultural stress distinguishes women of color from majority women faculty in these fields. The literature seldom, if at all, cites bicultural stress as a significant barrier for majority women in their pursuit of a career in academic science and engineering.

Tokenism. Tokenism occurs when individuals from a particular group account for 15% or less of the total in a given work context (Neimann, 2011); many faculty of color experience the impact of token status or tokenism. Individuals in tokenized contexts may experience symptoms that include the damaging effects of isolation and loneliness, distinctiveness, hyper visibility, and role encapsulation, or representativeness (Niemann, 2011).

By virtue of their token status, faculty of color are highly visible (Nieman, 2011). Thompson (2008), who studied the recruitment, retention, and mentoring of faculty of color, stated, "Although academe is viewed as a liberal space where individuals are free to express their thoughts, those individuals are often from similar backgrounds or share similar experiences" (p. 49). Niemann (2011) explained that the words and behaviors of token faculty are "easier to recall than are those of more homogenous group members . . . plac[ing] them on constant guard about the implications of their words, behaviors, and very presence" (p. 218). Many faculty of color have even reported the need "to change their identities to match those of White faculty" to

establish their legitimacy (Aguirre, 2000, p. 72). Thus, for many faculty of color tokenism has psychological, career-related, and personal consequences (Gutierrez y Muhs, Niemann, Gonzalez, & Harris, 2012). These impacts are particularly pervasive at predominantly White institutions (Niemann, 2011) because faculty of color often find themselves "being the only one of their race and/or ethnicity in their department" (Stanley, 2006, p. 6).

Furthermore, token status can also lead to heightened service burdens for faculty of color as they representracial diversity on panels or committees, as well as heightened visibility in teaching and classroom contexts (Cooper & Stevens 2002; Stanley, 2006). As a result, burnout, alienation, and marginalization can occur. Finally, token status can impact the psychological well-being of the lone or few faculty scholar(s) of color. The psychological safety associated with numbers is not available under this circumstance, feelings of pressure to acclimate or to assimilate to the dominant culture are present, and cognitive energy is spent ruminating about responses or lack of responses to these experiences (Niemann, 2011).

Early career faculty and White women in STEM also report difficulty with issues of isolation. The basis for isolation, however, is distinct on at least one level. The faculty of color literature cites reasons related to race/ethnicity and culture as a primary attribute to the experiences and feelings of isolation for faculty of color.

Racial microaggressions. The faculty of color literature frequently cites racial microaggressions as issues that must be navigated in the daily work lives of many scholars of color. Racial microaggressions are defined as "brief and commonplace daily verbal, behavioral, and environmental indignities, whether intentional or unintentional, that communicate hostile, derogatory, or negative racial slights and insults toward people of color" (Sue et al., 2007, p. 271). These subtle and often unconscious, yet powerful, derogatory insults communicate strong

messages about the subordinate standing of marginalized groups (Solorzano, Ceja, & Yosso, 2000).

Research that examines issues of race suggests that overt racism against people of color has been replaced by 'contemporary forms' of racism, described as more subtle and implicit in behaviors and actions (Sue et al., 2007). According to Sue et al., (2007), "perpetrators of microaggressions are often unaware that they engage in such communications when they interact with racial/ethnic minorities" (p.271). In particular, microaggressions can be manifested unconsciously from well-intentioned majority individuals who believe that they are racially sensitive and liberal (Goodman 2001; Wise, 2008). Sue et al., (2007) explains that, "most White Americans experience themselves as good, moral, and decent human beings who believe in equality and democracy. Thus, they find it difficult to believe that they possess biased racial attitudes and may engage in behaviors that are discriminatory" (p. 275). Due to the often invisible nature of microaggressions (Sue et al., 2007), microaggressive acts can "usually be explained away by seemingly nonbiased and valid reasons" (Sue et al., 2007, p. 275).

Currently, microaggressions are understood to appear in three primary ways: microassault, microinsult, and microinvalidations. Microinsults and microinvalidations often occur at the unconscious level, whereas microassaults often occur at the conscious level (Sue et al., 2007). Defined, microassults are "explicit racial derogation characterized primarily by a verbal or nonverbal attack meant to hurt the intended victim through name-calling, avoidant behavior, or purposeful discriminatory actions" (Sue et al., 2007, p.274). Microinsults are "characterized by communications that convey rudeness and insensitivity and demean a person's racial heritage or identity. Microinsults represent subtle snubs…clearly convey a hidden insulting message to the recipient of color" (Sue et al., 2007, p. 274). Finally, microinvalidations

are "characterized by communications that exclude, negate, or nullify the psychological thoughts, feelings, or experiential reality of a person of color" (Sue et al., 2007, p. 274).

Particular microaggression themes for African-Americans have included being racially/culturally isolated, being seen as atypical cases of success, and underestimating personal abilities (Torres-Harding et al., 2012). Themes associated with Latino/as have included having negative experiences related to language or speech quality, being subjected to generalized stereotypes about Latino/as, and questioning of qualifications (Torres-Harding et al., 2012). Without adequate resolution of such encounters, individuals of color may experience increased levels of racial anger, significant stress stemming from microaggressive acts, mistrust, and loss of self-esteem (Torres-Harding, Andrade, & Diaz, 2012; Sue et al., 2007).

Stereotype threat. Stereotype threat describes a "variety of situations that can make people perform or behave in a manner consistent with a negative stereotype" (Aronson & McGlone, 2009, p. 154). Compared to contexts where stereotype threat is reduced, it is well established that individuals perform less well when faced with this psychological predicament, such as on tests of intellectual ability or academic engagement. Stereotype threat results in disruptive psychological effects that lead to lowered performance levels due to interference of cognitive functioning and reduction of cognitive resources (Aronson & McGlone, 2009). The mechanism of stereotype threat is assumed to begin with general awareness of a particular negative stereotype about them or their affiliated group, leading targeted individuals to approach particular contexts watchful for confirmation of that particular stereotype (Aronson & McGlone, 2009). However, the degree of threat that individuals may experience depends importantly on individual differences, such as awareness levels or sensitivities to environmental cues (Aronson & McGlone, 2009).

Though just about anyone can experience lower performance when confronted with stereotype threat, it is "most likely and most keenly felt among historically stigmatized groups" (Aronson & McGlone, 2009, p. 157). Research indicates:

> The mere existence of stereotypes asserting the intellectual inferiority of marginalized groups creates a threatening intellectual environment for stigmatized individuals—a climate in which anything they say or do could be interpreted through the lens of low expectation. (Inzlicht & Schmader, 2012, p. 5)

Niemann (1999) noted that faculty of color may fall victim to internalizing stereotype threats that may undermine their own competence largely as a result of "experiences of racial tokenism, overt and covert racism, and stigmatization" (p. 111). Latina/o and African-American faculty may feel particularly vulnerable to the self-undermining effects of stereotype threat because a prevalent stereotype exists that individuals from these demographic groups lack competence in academic domains (Niemann, 1999). According to Niemann (1999), the attitudes and behaviors of one's colleagues are independent of this existing stereotype threat. As a result, "the obstacles faced by faculty of color involve interactive forces of two types of undermining—that done by others, and the self-undermining of competence (Nieman, 1999, p. 111).

Factors such as bicultural stress, tokenism, microaggressions, and stereotype threat are unique obstacles that affect scholars of color, and can also contribute to unfavorable climates and cultures for faculty of color. Here, I have highlighted how these issues affect scholars of color in the work-place and elicited why these obstacles are beyond those that have been described thus far for early career faculty.

In the following section I reviewed how these multiple contexts—the general nature of tenure-track faculty careers, the challenges that new faculty typically face, the particular

obstacles encountered by STEM faculty, the challenges salient to women faculty, especially those in STEM, and issues unique to faculty of color—come together to form the framework under which many early career STEM women of color faculty develop their tenure-track careers at predominately White, research universities. Keeping in mind the five contexts previously introduced, I began by briefly touching on the general challenges reported by women of color faculty.

Women of Color Faculty

Challenges

Women of color faculty frequently experience many of the challenges reported in the women and faculty of color literature more acutely and frequently than men of color and White women faculty (Mertz, 2011; Turner, 2002). For example, due to their multiple marginality status, they experience greater service burdens, such as being sought after for panels and committee assignments because they represent racial *and* gender diversity (Cooper & Stevens, 2002; Stanley, 2006). Similar to reports by majority women faculty, women of color faculty have also cited being inappropriately challenged by students in the classroom regarding their authority and academic credentials.

A third example includes the often held attitudes and biases about the abilities of women of color in academic settings. In their book, *Presumed Incompetent*, Gutierrez y Muhs et al. (2012) compiled and reviewed more than 40 empirical studies and personal narratives that focused on the role of intersecting gender, race, and class in the working lives of women faculty of color in academia. Based on documented interactions with colleagues, senior administrators, and students in academia, the authors found that women of color faculty frequently experienced

attitudes and behaviors that presumed their intellectual incompetence (until they proved otherwise).

Additionally, deeply embedded and traditional power structures within academia contribute further to the marginalization of women of color. For example, in regard to hiring and those who are represented in leadership positions, academia historically favors men over women, and Whites over non-Whites (Aguirre, 2000; Allen et al., 2002; Keith-Spiegal, Whitley, Balogh, Perkins, & Wittig, 2002; Mertz, 2011). Mitchell and Miller (2011) stated, "Women faculty of color are neither male nor White and subsequently do not have access to the privilege inherent in male and/or White group membership" (p. 210).

Women of Color Faculty in STEM

Statistics

A disparity exists between the representation of White women and women of color in the professoriate overall, and in the STEM fields specifically. In 2009, Caucasian women made up the majority of female professors at the assistant professor level (72.1%, compared to 7.9% Black women and 4.2% Hispanic women) ("Percentage of Faculty Members," 2011). At the associate professor level, Caucasian women also comprised the majority of female faculty (80.7%, compared to 6.6% Black and 3.8% Hispanic) ("Percentage of Faculty Members," 2011). Finally, for women at the full professor level, Caucasian women constituted the majority of women's representation (86%, compared to 4.7% Black and 3.0% Hispanic) ("Percentage of Faculty Members," 2011).

Compared to 40 years ago, these low figures reflect incremental gains for women of color who have entered the professoriate. Despite this, however, they persistently hold "fewer positions in postsecondary institutions (7.9%) than White females (34%), White males (41.3%),

and males of color (8.4%)" (Mertz, 2011, p. 42). In the STEM fields, women's overall representation in the professoriate begins to plummet, especially as faculty rank increases.

Of the women engineers located at the "top 50 departments" in 2005, 6.9 % were at the level of assistant professor, 11.7% were at the associate level, and a meager 3.68% were full professors (Handelsman et al., 2005). At these same top 50 departments in the physical sciences, women made up 16.1% of assistant professors, 14.2% of associate professors, and 6.4% of full professors (Handelsman et al., 2005). Finally, in biology, women constituted 30.2% of assistant professors, 24.9% of associates, and 14.8% of full professors (Handelsman et al., 2005).

Women of color make up a very small fraction of these already low percentages of women faculty in these disciplinary areas. Towns (2010) explained that for every science discipline, each independent group—Black, Hispanic/Latina, and Native American women—makes up less than 1%. According to Towns (2010), the raw numbers for tenured or tenure track faculty at the top 100 research institutions were as follows for African-American women: in chemistry 8, in physics 2, in computer science 6, in math and statistics 7, in the biological sciences 26, in astronomy 2, and in earth sciences, 4. For Hispanic women the raw figures were: in chemistry 13, in physics 9, in computer science 5, in math and statistics16, in the biological sciences 45, in astronomy 1, and in earth sciences, 8.

In another report, Nelson and Brammer's (2010) study on faculty diversity in the top 50 US research university science and engineering departments, only 88 out of 1,678 women were tenured or tenure-track women of color faculty of the total 14,400 faculty count. Clearly, women of color are noticeably absent as members of the professoriate in the STEM fields. It is reasonable to conclude that White women have experienced a greater share of the advancement made by women in recent decades compared to women of color faculty in these fields. This

short statistical overview has highlighted that a disparity exists between majority and underrepresented minority women faculty overall, and specifically in the STEM fields. Much work remains to be done to gain a better understanding of the higher education landscape as it relates to the underrepresentation of women of color faculty in STEM.

Challenges

As mentioned in chapter one, Malcom et al. (1976) was among the first to study women of color faculty in STEM. In their landmark report, *The Double Bind: The Price of Being a Minority Women in Science,* the authors concluded that women of color face an extraordinary taxation—that of being simultaneously subjected to gender-related obstacles as early career faculty women, *and* racial-related obstacles as minority faculty in STEM. In a follow-up study that examined the current status of women of color in science and engineering against its thirty-five year history, Malcom and Malcom (2011) observed:

> Now, it is less about rights versus wrongs and more about support versus neglect; less about the behavior of individuals and a culture that was accepting of bias… and more about the responsibilities and action (or inaction) of institutions. (p. 163)

The authors argued that for women living at the intersection of race and gender, "sex-based barriers are only half the story" (p. 163). Finally, Malcom and Malcom (2011) concluded that despite progress over the decades, many obstacles still remain. Although the literature on women of color in STEM is still developing, one persistent issue that has surfaced is that of the values and culture of science versus the culture values and ethnic/cultural identities of women of color.

Values and cultures. Many studies point to the psychological toll of "gendered racism" for women of color faculty, particularly in STEM departments at predominantly White, research-

intensive universities (Malcom & Malcom, 2011; Turner, 2002; Turner & Myers, 2000; Stanley, 2006). Ong (2005) stated that "Matters of gender, race, ethnicity, social class, immigration status, and sexual orientation have no acknowledged place" (p. 598) in the realm of science. These factors partially account for why academic women of color scientists, engineers, and mathematicians have frequently perceived poor departmental climates and cultures.

As a result of gendered and racialized experiences, in conjunction with a lack of space that openly acknowledges the factors that make up the identities of STEM women of color, undue stress in having to tenuously negotiate their cultural identities with their professional scientific identities has been reported. Women of color feel pressure to enact this delicate balancing act between identities because scientists gain much of their authority and prestige in their fields by upholding science's appearance as objective, universal, and context free (Haraway, 1991; Harding, 1991; Latour, 1987).

According to Hess (1997), within the culture of science, scientists rarely acknowledge that scientific activities involve certain context-laden assertions, subjective judgments, and particularistic practices. Mannerisms such as aggressiveness and arrogance (Georgi, 2000; Gibson, 2003), values such as independence and competitiveness and traits such as White, middle-class, and male-associated physical appearance (Margolis & Fisher, 2002) commonly assume superiority and are rewarded in science (Ong, 2005). Ultimately, these factors work together to frame the climates and cultures typical of many science and engineering departments.

Additionally, science culture espouses a meritocratic position and possesses notions of being intellectually superior to other academic fields because of the required technical expertise (Johnson, 2011). Taken together, these practices, assertions, norms, and judgments associated with academic scientific culture explicitly or implicitly maintain specific values. In a study

conducted by Johnson (2011) on women of color students in STEM fields, Johnson found that these values "stood in sharp contrast to the cultural values for women of color who strongly identified with their racial, ethnic and cultural backgrounds" (p. 81), making it difficult for these women to navigate STEM environments.

For example, "*la cultura Latina"* teaches Latinas "to be *pulcra* (pure) and passive," "to ask permission for everything," and to be "discouraged from . . . aggressiveness" (Hernandez-Truyol, 2003, p. 64). Further, Latinas are ascribed to particular gender roles within the Latino community, where cultural expectations and norms are such that family needs and extended family are not only of central importance but sacrosanct (Ginorio, Guierrez, Cauce, & Acosta 1995; Hernandez-Truyol, 2003). Due to the significant negative spillover of academic work life into the personal lives of junior faculty (Austin et al., 2007), work and cultural expectations related to family and gender roles for Latinas may frequently result in conflict with each other. This frequent work-culture conflict may result in undue strain for Latina faculty in STEM because their personal cultural existence has "no acknowledged place" in the realm of science.

Black women scientists and engineers may also face unique cultural barriers that they must negotiate. Direct communication style is highlighted in the literature as one of those barriers that can hinder the career advancement for Black women faculty. Edmondson (2012) stated:

> One component of their identity that has been identified as a barrier to career advancement is their . . . communication style. [Because] most institutions do not explicitly state that subjective factors such as personality and communication style are also factors in the [promotion and tenure] decision making . . . Black women with direct communication styles may be disadvantaged by this. (pp. 328-329)

While for many Black women professionals a direct communication style is criticized (Shuter & Turner, 1997), "directness is seen as a positive attribute in White male leaders" (Edmondson, 2012, p. 328). Even though "communication styles are learned behaviors" (Edmondson, 2012, p. 337), Black professional women may often experience the stress of having to adapt their natural communication style to what is expected based on dominant norms. Like Latina faculty, this may cause undue stress on a daily basis.

Ong (2005) points to the difficulty for women of color to claim membership in the context of science when they are "maintain[ing] the appearance of belonging to a culture of no culture" (p. 598). The literature further acknowledges that a conundrum exists for women of color faculty that is rooted not in requisite skills, technical knowledge, or preparation, but in the difficulty and conflict for women of color having to deal with persistent biases (Jean-Marie & Lloyd-Jones, 2011) in the scientific realm.

The examples in this section illustrate the distinct barriers faced by STEM women of color that are rooted primarily in their existence at the intersection of race, gender, and science. Taking the information presented here with the previous five contexts reviewed, one may appreciate the complex setting in which many early career women of color STEM faculty develop their tenure-track careers.

Up to this point in the literature review, I have focused on layering the multitude of challenges which frame the context for early career STEM women of color faculty.

Despite these challenges, ultimately it is necessary for all junior faculty to successfully navigate the academic, promotion, and tenure landscape if they are interested in advancing their careers. The remaining literature review shifts focus to strategies that serve to support the

successful advancement of all early career faculty, and to the extent possible, women in STEM and women of color faculty.

Strategies to Support Early Career Faculty

Practical strategies for junior faculty have been documented in the literature, but this area of scholarship is not yet fully developed. For instance, as one seeks to find success strategies for increasingly specific demographic groups—from all early career faculty, to early career faculty in *STEM*; to *women* faculty in academic *STEM* fields; and finally *women of color* in *STEM*—the literature slowly shifts away from strategies that address the objective of attaining tenure, largely to (but not exclusively) coping mechanisms on how to 'survive' a majority academic culture for women of color faculty across discipline and rank. Very little has been written about the successful career paths of Black and Hispanic/Latina women academics in the STEM fields. Additionally, the sets of literature reviewed for this study revealed that to date, studies have focused more on the challenges over persistence and successful career advancement in general. While the general topic area of 'challenges' contains many studies with a theoretical and empirical base, what has been written in terms of success strategies in the professoriate is not as robust in this respect.

What *is* clear to researchers, institutional leaders, and faculty development professionals at this time is that a single strategy is not sufficient to ensure success; rather, multiple efforts are necessary (Austin et al., 2007; Gappa et al., 2007). Below I highlighted promotion and tenure success strategies written for a general early career faculty audience and, to the extent possible, I have reviewed strategies targeted to support women in STEM and women of color faculty.

Strategies for All Early Career Faculty

What has been written about in terms of success strategies for and about junior faculty does not necessarily or neatly correspond to the many challenges reported thus far. The three main areas written about to support the successful career advancement of junior faculty are 1) related to the nature of faculty work itself, and the essential skills necessary to increase one's success as a faculty member; 2) information that may assist junior faculty to manage a heavy work-load with competing demands; and 3) suggestions for building collegial communities.

Basic skill-sets for faculty. Researchers have pointed to a broad set of core skills within the areas of research, teaching, and service that junior faculty should possess in order to increase their chances of success. Austin and McDaniels (2006) point out that new faculty must be able to frame, design, and analyze original research questions and projects. They should also be able to craft successful grants and should possess the skills to communicate findings to a range of audiences, from policy makers to community members (Austin & McDaniels, 2006). Simultaneously, new faculty members should know how to support the engagement of active learning to diverse learners, assess student learning, develop course curriculum, and facilitate classroom learning using technology (Austin & McDaniels, 2006).

Both research and teaching are essential elements of being a faculty member. Should teaching pose a particular challenge for junior faculty, it has been recommended for junior faculty to make appointments with their department chair or seek to connect with individuals in and outside of their department who are committed to teaching and student learning (Sorcinelli, 2004). Boice (1991; 2000) advocated for the importance of beginning teaching preparation as well as research or writing (e.g., grants, research publication articles) before one is 'ready' so as to avoid procrastination or postponing of these critical activities. Sorcinelli (2004) further

pointed out that it can take approximately two to three years to get established and, thus, advised junior faculty to pace themselves out and plan accordingly for the long run.

Service is also a basic requirement for tenure track faculty. In effort to align service with tenure, Sorcinelli (2004) recommended that early career faculty should engage in activities that will ultimately help advance their careers. For example, if there is a service choice between chairing the department website committee versus being in charge of departmental seminars, junior faculty should elect service in the latter because it may help them establish relationships and expand their network of colleagues with prominent people in their field (Sorcinelli, 2004). Additionally, Austin and McDaniels (2006) advised early career faculty to keep their service activities relevant to their promotion and tenure efforts and to their disciplinary area by connecting theory to practice.

It is also essential for junior faculty to learn strategies that will enhance their productivity and their reputation as professionals and experts. In order to accomplish this, some authors have highlighted the importance for junior faculty to enhance their professional development activities. Junior faculty should consider activities such as regularly reading teaching and research publications, committing themselves to ethical behavior, and managing their professional image (Austin & McDaniels, 2006; Whicker et al., 1993). Another way to enhance success is to cultivate a specialty that comes naturally, that is enjoyable, or that draws on one's strengths, as suggested by Solem and Foote (2004) and Sorcinelli (2004). In order to enhance productivity, it is essential for new faculty take time out to engage in outlets or activities that will allow them to recharge as a means to avoid burnout and to maintain or even heighten productivity (Sorcinelli, 2004).

Managing work-load and competing demands. Undoubtedly, junior faculty are faced with many competing demands and, frequently, a heavy work-load. One way to ameliorate this balance is to avoid working on everything at once and instead work in brief but regular sessions (Boice 1991; 2000, Sorcinelli, 2004). Further, Sorcinelli (2004) advised junior faculty to consistently devote one-quarter of their time to a priority item (e.g., writing a book chapter, developing a new course) and split other duties across three-fourths of their remaining time as a strategy to manage competing demands. According to Sorcinelli (2004), new faculty should also develop a two- to three-year plan that outlines their goals and then consult with a senior person in their department to fine tune the plan into achievable and realistic parts as another way to prioritize competing agendas.

Building collegial communities. Early career faculty report difficulty in building collegial communities, finding mentors, and engaging in networking activities. A strategy for junior faculty to overcome these obstacles includes identifying individuals with whom they share similar backgrounds in order to establish a platform upon which they may begin communication (Whicker, Kroenfield, & Strickland, 1993). Other strategies provided to overcome these barriers include meeting with the department chair to ask if it is possible to be introduced to a senior colleague, spending time in the faculty lounge where much socialization takes place, and inviting colleagues to attend a classroom session and asking for feedback (Solem & Foote, 2004; Sorcinelli, 2004). Finally, early career faculty are encouraged to proactively expand the traditional mentor-mentee model to a network of multiple mentors, both formal and informal, peer to peer, inside and outside of the department, and to 'not give up' in seeking people out, as other faculty are just as busy as they are (Foote & Solem, 2009; Sorcinelli, 2004).

In this section, I have provided a brief review of the literature on general success strategies aimed at all junior faculty that were drawn from the faculty development literature; namely, ways junior faculty can build collegial communities, manage competing demands and work-load, as well as identifying what core skills are necessary to foster a successfully faculty career. In the following section, I captured the strategies targeted to support the success of tenure-track junior women faculty in STEM.

Strategies for Women in STEM

As highlighted previously, the literature highlighted work-life balance and access to strong collaborative networks and mentoring as key challenge areas for many women faculty, and especially for women faculty in the STEM fields. The information below briefly highlights practical strategies as well as conceptual strategies that may assist in supporting the successful career advancement for women faculty, and certainly to some extent, may also serve as useful strategies for women in STEM.

Managing work-life balance. Young and Wright (2001) addressed the issue of work-family balance while on the tenure-track. In their article, *Mothers Making Tenure,* the authors examined the experiences of 22 tenure-track mothers in social work programs. The authors interviewed women faculty and compiled a list of strategies that the participants found useful to manage their work and family responsibilities. It is important to keep in mind the distinction between disciplinary culture and norms of social work programs and those of science, technology, engineering, and mathematics disciplines. The degree of utility in what these authors recommended may vary for women faculty depending on their disciplinary area. The personal and practical strategies offered in this article may nevertheless provide constructive solutions to many women who are also mothers on the tenure-track.

A main finding of this study was that "care of family mainly centered on time management issues" (Young & Wright, 2001, p. 561). The authors organized the strategies most cited by their study participants into five broad categories: *care of self, care of family, use of support, focus on tenure,* and *maintain balance.*

Practical strategies under the *care of self* category included women faculty speaking to other mothers who are faculty members, and the willingness of women faculty to accept time limitations that relate to family reasons. For *care of family*, the authors highlighted the following strategies: 1) minimize time spent on work over weekends, 2) have a backup childcare plan, and 3) have talks with your child/ren about work. Young and Wright (2001) wrote, "One mother stated that talking with her daughter to increase her understanding of the demands of the tenure process was helpful in sustaining family harmony" (p. 561). They noted, that "this strategy is possible if children are old enough to understand the ramifications of what is being explained" (Young & Wright, 2001, p. 561).

The practical strategies suggested under the third category, *use of support*, included: requesting partners to do more, hiring a housekeeper, asking family members and friends for help, and participating in carpooling if possible. Regarding the *focus on tenure* category, several strategies were also captured. The first was for women faculty who are mothers to establish priorities. One suggestion surrounded the act of writing. For example, writing strategies included to write at least 15 minutes every day, write during the summer, and at home when others are away or sleeping. Other strategies under this category included making actions and decisions that led to maximizing projects to include scholarship, teaching, and service components. Finally, *focus on tenure* also included a strategy for maintaining contact and

relations with colleagues. Since time is of essence, it was recommended that meeting for lunch was enough to maintain basic connections with others.

Finally, the fifth category, *maintaining balance*, suggested the following personal strategies for early career faculty mothers on the tenure-track: say "no" and stick to a schedule, use checklists that clearly separate "work" and "home" time, develop the flexibility to work anywhere, and practice good time management.

The practical strategies listed above are useful as a general guide for early career women faculty who are mothers on the tenure-track. As mentioned above, the degree of utility of these strategies may vary from one disciplinary and departmental context to the next. Women in STEM, in particular, face unique challenges due in part to working in a male-dominated domain. Personal preferences and circumstances may also play a role in the likelihood of tenure-track mothers to engage in these strategies. The following section provides a brief summary of the strategies that have been written to support the success of women of color faculty in STEM.

Collaborative networks and mentoring. A main challenge for women faculty in STEM is the difficulty in getting connected into collaborative networks. Bozeman and Corley (2004) conducted a study that examined data from 451 scientists and engineers at academic research institutions. Their focus was to examine scientists' collaboration choices and strategies. Although this study targeted faculty who are in science, the spectrum of collaborators ranged from "post-doctoral researchers to full professors" (p. 600) who were from a "wide variety of universities" (p.600) and were from "different [scientific] research fields" (p.600).

According to Bozeman and Corley (2004), many scholars agree on two things: 1) that collaborations stem from informal conversations between colleagues, and 2) the closer potential collaborators are in proximity to each other, the more likely they are to engage in informal

conversation which can lead to collaboration. At minimum, junior women in STEM should capitalize on informal conversations and spatial proximity as they seek to mobilize potential collaborative networks.

Beyond this, Bozeman and Corley (2004) found two forms of action that led to tenure and increased collaborations. They reported that, "those who pursue a 'mentor' collaboration strategy are likely to be tenured…[and] those who have larger grants have more collaborators" (Bozeman & Corley, 2004, p. 599). The authors also identified senior-junior faculty collaborations that specifically take on mentoring characteristics as a strategy type that is most beneficial in assisting early career faculty to attain network ties. Although this is critical information, the question of *how* junior faculty women in engineering, for instance, should go about successfully pursuing or developing this type of collaboration was not addressed.

Additionally, Bozeman and Corley (2004) identified four types of collaborators: the "taskmaster"—"researchers who tend to choose a collaborator based on work ethic attribution and whether or not the person sticks to a schedule" (p.609-610); the "nationalist"—researchers who "tend to choose collaborators who are fluent in their own language and are of the same nationality" (p. 610); "mentors"—who are collaborators that "are motivated to help junior colleagues" (p.610); and the fourth collaborator type, the "follower"—"these researchers choose collaborators mostly because someone in administration requested that they work with the collaborator and the potential collaborator has a strong science reputation" (p. 610). At minimum, early career women in STEM should explore and become aware of their own 'collaboration style' preferences as a strategy to maximize and strengthen their collaborative experiences. To the extent possible, early career STEM women should also keep alert, for

example through observation, of the collaboration preferences of potential senior faculty collaborators as they seek to develop opportunities for themselves.

Despite the fact that network collaboration and mentoring is named as a primary challenge for tenure track women in STEM, Bozeman and Corley (2004) noted that the topic of science and technology research collaborations in relation to human capital "is not a common theme" (p. 600) in the literature. How, then, should women in STEM acquire collaborative networks, especially mentors? Chesler and Chesler (2002) wrote about gender informed mentoring strategies for women scholars in engineering that elicit possibilities.

Chesler and Chesler (2002) asserted that improved mentoring is a key strategy for increasing the advancement of women scholars in engineering. Although not an empirical study, the authors reviewed the literature on alternative mentoring models and succinctly compiled them for women in science to consider as strategy options. For instance, they wrote about multiple mentoring, which the authors believe is "likely to be more successful for most women (and many men)" (p. 49).

"Multiple mentoring encourages the protégé to construct a mentoring community based on a diverse set of helpers instead of relying on a single mentor" (Chesler & Chesler, 2002, p. 51-52). In their review, the authors captured various ways that young faculty can think about multiple mentoring. One way is to think of a "composite mentor" (Chesler & Chesler ,2002, p. 52) whereby one considers "the attractive traits of different role models in their environment" (Chesler & Chesler, 2002, p.52). An effort to assemble a diverse set of mentors, this approach can assist women in making use of the available images in their environment, "including men and people from different backgrounds" (p. 52). Multiple mentoring may "jumpstart" a

scientific career (Chesler & Chesler, 2002) because it promotes early inclusion in the development of contacts within a strong professional network (Chesler & Chesler, 2002).

However, as the authors stated, "the disadvantage of this approach is that the burden of community-building is laid upon the protégé. Also, finding a diverse set of helpers who meet the various and changing needs of the protégé in a new institution is…not a trivial task" (Chesler & Chesler, 2002, p. 52). Effective ways in which women should go about overcoming the "burden" of finding composite mentors, given the limited time and juggling priorities of junior women in STEM, was not addressed.

Another mentoring strategy proposed by Chesler and Chesler (2002) is the peer mentoring model. The peer mentoring strategy de-emphasized seniority and hierarchy and focused instead on building community. This model may assist women in academia because it promotes flexibility and informality, which enables women to "drop in and drop out" (Chesler & Chesler, 2002, p. 52) as they need. "More generally, this flexibility in time and level of commitment directly addresses problems that women often experience with the traditional mentoring model; that is, unpredictable family and child-care responsibilities and career interruptions" (p. 52).

Chesler and Chesler (2002) cite Etkowitz's (2000) work which emphasized that "such peer-generated or 'bottom up' strategies only will be successful if powerful senior faculty and departmental leaders support such efforts and provide them with necessary resources and affirmations" (p. 52). However, effective ways for junior women to enlist one or more senior faculty member to commit to a "bottom up" peer mentoring circle was not addressed.

While the work-life balance and collaborative networks/mentoring strategies were not written exclusively for women in tenure-track STEM careers, they nevertheless offer suggestions and ideas that some may find useful. Next, I touch on strategies for women of color in STEM.

Strategies for Women of Color in STEM

As previously noted, for women of color faculty, the literature offers mostly general advice on 'how to survive' academe and, in particular, dominant culture academe. Most of the "practical strategies" literature that I reviewed for women of color faculty mirrored what has been written in the literature for all early career faculty and is not discipline specific. To my knowledge, there was scant information on empirically based works that offered strategies to support the promotion and tenure success of early career Black and Hispanic/Latina women faculty in the STEM fields at predominately White, research universities. The less developed review below is a direct reflection of this underdeveloped area in the literature.

I briefly point to the unique nature of advice offered to women of color in academe. The themes I have captured below are based on cited works in three books: *Tenure in the Sacred Grove* by editors Cooper and Stevens (2002), *Women of Color in Higher Education: Changing Directions and New Perspectives* (2011) by editors Jean-Marie and Lloyd-Jones, and *From Oppression to Grace* by editors Berry and Mizelle (2006). Together, these three books form a compilation of works by 58 contributing authors.

Coping. An array of coping mechanisms was the most prevalent form of advice provided to women of color faculty on how to survive academe in ways that would allow them to persist, particularly within dominant culture at predominately White institutions. Three primary themes emerged in the literature in terms of coping strategies for this demographic group: spiritual, personal and through the help of others. The use of the actual term 'coping' as a

strategy was prominent. I have provided a list of words, phrases, and pieces of advice taken from the literature above that reflect various coping strategies that were offered: prayer; spirituality; positive meditation; identifying a support person that may assist in psychosocial as well as professional development regarding the tenure process; turning to family and community as a main source of support; holistic health habits that 'soothes the soul' and helps to maintain one's psychological health and inter-subjectivity; seek out and develop mutually empowering relationships with other faculty of color to not feel alone and help to 'unload'.

Coping related to identity and ethnicity/race. A sub-category of coping focused on issues related to racial, ethnic, and cultural identity that addressed the issue of being women scholars of color working within a culturally-dominant university setting. The following phrases provide examples that fell under this category and provide a sense of the type of strategies and advice offered to women of color faculty scholars: bring to consciousness and acceptance that you may be viewed as 'other'; understand the membership process of the culture and climate of your institution or department, both disciplinary and dominant culture; be prepared to live cultural contradictions; be prepared to be lonely as the sole person of color or one of a few and how that might affect you; be prepared to make cultural, emotional, and social adjustments; develop one's academic persona, but do not let it be consuming nor lose one's authentic cultural identity in the process such that one forgets who she "really is".

Politics. Strategies that aim to reach women of color faculty point to the necessity for faculty of color to quickly become aware of racial politics and climate at their institution/department. Forms of political strategies included: become aware of the historical exclusion of people of color at your particular institution; learn the bureaucracy of one's

academic environment; know that the politics of race has no racial boundaries; do not assume an 'organic camaraderie' between faculty of color, allies can be of any gender or racial persuasion.

Networks. Unique strategies that promote proactive stances for women of color faculty to develop professional networks drew connections between their historical marginalized position in societyand that of their work place. One approach suggested reminding women of color that they have long had to practice forms of informal social networking to challenge structural and cultural barriers, and to carry this practice of proactive informal social networking over to work-place circumstances in order to empower themselves and to help facilitate their upward career mobility.

To summarize, this section has reviewed some of the success strategies found in the literature for all early career faculty, for women and women in STEM, and for women of color faculty. As previously noted, the literature slowly shifts away from offering practical strategies that support the promotion and tenure success for a general early career faculty audience, largely to strategies that focus on ways for women of color scholar's to cope in predominately White academic settings. There is also an overall trend of lacking strategies that are both practically and theoretically examined to assist early career faculty, women, and faculty of color who are seeking successful promotion and tenure in the STEM fields.

Critique of the Literature

The topic of women's underrepresentation in academic STEM fields has been examined for over thirty years. However, during this timeframe, women of color were either excluded from research designs, or researchers elected to not investigate the impact of gender-race intersectional differences between women during this period (Johnson, 2011; Atwater, 2000). A main reason for this was that "their numbers were too small for any meaningful analysis"

(Johnson, 2011, p. 75). Turner, González, and Woods (2008) point out that research generated on faculty of color began to focus on examining the intersection of race/ethnicity and gender beginning in approximately 1988, but it was not until the recent time period of 2003-2007 that the literature reflected emergent issues of interest in STEM faculty of color.

This basis suggests that the majority of foundational empirical research literature that has captured the experiences of women faculty in STEM has largely excluded the viewpoint of women of color and, by default, is largely based on the perspectives of majority women faculty scientists, engineers, and mathematicians. Undoubtedly, the empirical data that has been generated is extremely valuable and useful. However, Johnson (2011) noted, "Women of color should not be further marginalized in a body of research that, in theory, is about transforming women's underrepresentation in male-dominated academic disciplines and career fields" (p. 75).

Furthermore, US research literature on the underrepresentation in STEM has been continuously framed in terms of women *or* racial minority groups (Ong et al., 2011). This is problematic because framing in this manner suggests that categories of race and gender are additive and mutually exclusive when instead, they are dynamic and synergistic (Leggon, 2006). Leggon (2006) explained that "this focus is due in part to the way data on the science workforce have been traditionally collected: by race/ethnicity OR sex, but not by race/ethnicity AND sex" (p.325), although this is slowly changing.

Without considering the differential experiences of Black and Hispanic/Latina women or the effects of racial privilege for White women in STEM, conceptions of a universal gender experience among women are cultivated and critical aspects of women's experiences in these fields is obscured (Hanson, 2004; Collins, 1999; Atwater, 2000). After examining the progress of women in science, Clewell and Ginorio (1996) asserted, "it is no longer feasible, or

appropriate, to conduct research solely on [W]hite subjects and use the findings of this research to make policy decisions for the entire populace" (p. 216).

Research suggests that racial and gender identities are mutually formative and that taking into consideration the critical intersection of race *and* gender may influence the meaning of each characteristic significantly. For example, the constructions of gender systems in African-American and White-American communities may not reflect one another and may provide distinctive information for understanding the career experiences of Black women in science and engineering (Hanson, 2004). Furthermore, if African-American and White-American families organize gender roles differently, then it is possible that African-American women may not necessarily perceive early career work-life balance conflicts in the same manner as White women (Anderson & Collins, 1995; Collins, 1987). This may impact how we understand work-life balance of early career women in academic STEM.

Leggon (2003; 2006; 2010) has consistently argued that the failure to systematically take these distinctions into account results in ineffective and inept practices, programs, and policies for developing and advancing the scientific workforce. Ong et al., (2010) calls for a "final overarching need for theoretical and conceptual frameworks that address women of color in STEM as a stand-alone population" (p. 42). In its current state, early career women of color in STEM are mostly caught in the crossroads of literature spheres that focus on faculty of color broadly, on majority women in STEM specifically, and 'somewhere' in the early career faculty development literature. Without disaggregating existing and future data systematically and consistently, the extent to which the tensions and strategies interact for women of color in academic science and engineering will remain less clear. The current composition and landscape of US faculty women stresses the importance of taking these proposals seriously.

Finally, it must be noted that the acronym "STEM" is a commonly accepted umbrella term that refers to science, technology, engineering, and mathematics fields. However, embedded in the term are four distinct disciplinary areas, each with varying dimensions of norms, expectations, and challenges.

Summary

There are three distinct tenure-track faculty career stages: assistant professor (early career stage), associate professor, and full professor. The expectation of teaching, service, and research responsibilities make up the major requirement areas for promotion and tenure. Specific evaluations to achieve tenure are likely to vary at least minimally from institution to institution, and between disciplinary areas. This is the first setting which must be taken into account to understand the context under which racially and ethnically underrepresented STEM women faculty work.

The second setting includes typical challenges often encountered during the early career stage for most probationary faculty. This includes negotiating the expectations and requirements of the tenure and promotion process itself, building collegial communities, and managing time given many competing demands. Third, many early career faculty in the STEM fields face unique obstacles,namely, heightened grant and publishing pressure, a highly competitive and largely homogenous scientific culture, and obstacles related to technical infrastructure. A fourth framework is that distinct barriers exist for women faculty who are in these fields. These challenges include a lack of professional networks, gaps in mentoring, difficulty achieving a harmonious work-life balance, and challenges related to dual-career couples.

Additionally, the faculty of color literature points to biases that faculty of color must often negotiate, such as issues related to bicultural stress, tokenism, racial microaggressions and

stereotype threat. Women of color faculty typically experience many of these accumulated barriers more frequently and acutely due to their multiple marginality status. Women of color faculty in STEM specifically cite culture and climate as a main obstacle in their careers, not technical inability. Statistics show that while much progress has been made regarding the representation of women in academic STEM, a clear disparity exists between the representation of minority and majority faculty women in these technical fields. These interlocking elements set the stage for understanding the source of many of the obstacles faced by STEM faculty who are women of color as they pursue and develop their faculty careers.

Due to the well documented challenges and the desire to assist faculty in their careers, strategies have been written to support the success of early career faculty in their pursuit to achieve tenure. Success strategies reviewed in this chapter included those for all early career faculty, for women faculty and women in STEM, and for women of color faculty. However, as one seeks to find success strategies for increasingly specific demographic groups—from early career faculty, to early career faculty in STEM; to women faculty, especially women in academic STEM; and finally women of color faculty in STEM careers—the conversation slowly shifts from strategies to attain tenure to largely coping mechanisms provided for women of color across disciplines to 'survive' dominant culture academy. In general, the current faculty development literature offers a greater understanding of factors that contribute to the challenges of early career faculty over information that leads to successful careers.

In this chapter, I provided a review of the literature that captured the challenges reported by early career tenure-track faculty, including the success strategies written to assist junior faculty through the probationary period. The next chapter presents the methodological details of how I framed and conducted my study.

CHAPTER 3: METHODOLOGY

This chapter outlines the methodological approach and research design that I followed to conduct my study. The organization of this chapter is as follows: (a) statement of research question (b) conceptual and theoretical framework (c) research paradigm (d) methods, data collection and analysis (e) reflexivity, and (f) limitations of this study.

Research Question

In this study, I addressed the following question: *What contributes to the successful career advancement of women of color faculty in the fields of academic science, technology, engineering, and math?* My sub-questions are:

a) What strategies did tenured Hispanic/Latina and Black women faculty in STEM enlist to successfully overcome personal, organizational, and disciplinary related challenges amidst the early career promotion and tenure process?

b) What factors enabled them to persist through these challenges?

Conceptual and Theoretical Framework

This section provides an overview of my conceptual and theoretical framework. My study was guided by two main perspectives: information drawn from the current faculty development literature, and social cognitive theory with a focus on the role of self-efficacy and personal agency. Broadly speaking, I drew from two bodies of literature, academic work-place/academic work, and literature on self-efficacy/personal agency because these aspects have not been explored as much in faculty work related to successful women of color in STEM.

Faculty Development Literature

The literature review presented in chapter two brought together related, but distinct, bodies of faculty development literature. Drawn from these works, I outlined the challenges

commonly experienced by early career faculty, faculty in academic STEM disciplines, women faculty, especially women in STEM, faculty of color, and women of color. In my literature review, I emphasized that information specific to the promotion and tenure experiences of early career STEM women of color faculty is still emerging, and is often 'lost' or embedded somewhere at the intersection of these distinct bodies of literature.

After synthesizing these literature sets, I developed the diagram below **(Figure 1)** which depicts how I conceptualized the *salient challenges* for early career women of color faculty in STEM. The center of the venn diagram represents those individuals who exist at the intersection of gender, race, and STEM. This center also serves as a focal point to capture the challenges that may be most significant for early career women of color faculty in STEM.

This conceptual diagram guided the "challenges" aspect of my study. That is, this model served as a starting point that enabled me to probe and to explore the obstacles potentially faced by my study participants amidst the promotion and tenure process during my interviews with them. The other aspect of my study was guided by a theory drawn from the developmental and social psychology literature. Bandura's social cognitive theory is a useful theoretical basis to suggest why women of color faculty in STEM successfully persist through difficult career development contexts. Initially, I provided an overview of key concepts regarding social cognitive theory. Next, I focused on the importance of self-efficacy and linked its role to personal agency. I ended this section by explaining how my conceptual and theoretical underpinnings guided my study.

Social Cognitive Theory

Bandura's social cognitive theory is the overarching theoretical framework of the self-efficacy construct (Bandura, 1986). It takes on an agentic perspective of human functioning,

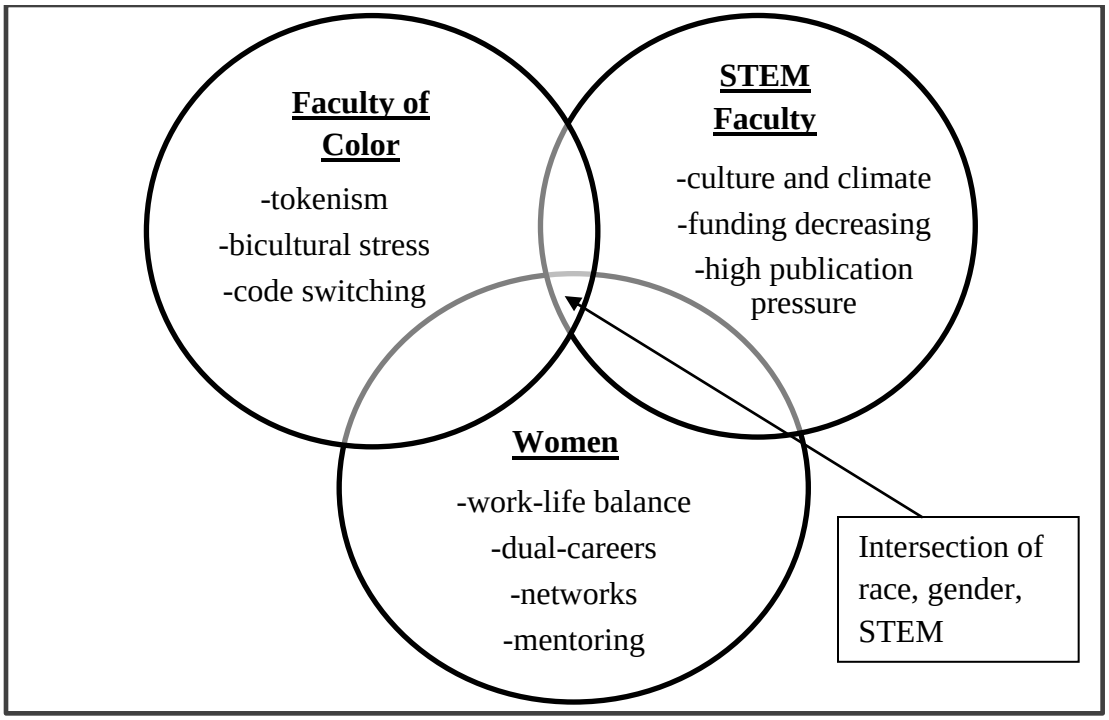

Figure 1. **Salient Challenges: Early Career Women of Color Faculty in STEM**: Each circle represents a body of faculty development literature and the associated salient challenges for early career faculty within each. Challenges at the intersection of race, gender, and STEM, are represented at the core of the diagram.

meaning that individuals have some limited ability to control their lives. According to Bandura (1998; 2006), there are three major influences that determine human functioning: (1) the external environment; (2) intrapersonal factors (cognitive, affective, and biological); and (3) behavior—a model that Bandura calls *triadic reciprocal causation* **(Figure 2)**. Reciprocal causation is the idea that behavior is controlled or determined by both the interactions of the individual through cognitive processes and by the environment through external social events.

Bandura (2006) explained this "triadic interaction includes the exercise of self-influence as part of the causal structure" (p. 165). Self-influence should not to be confused with 'free will', but, "in acting as an agent, an individual makes causal contributions to the course of events" (Bandura, 2006, p. 165). Within this perspective, a person's behavior both influences

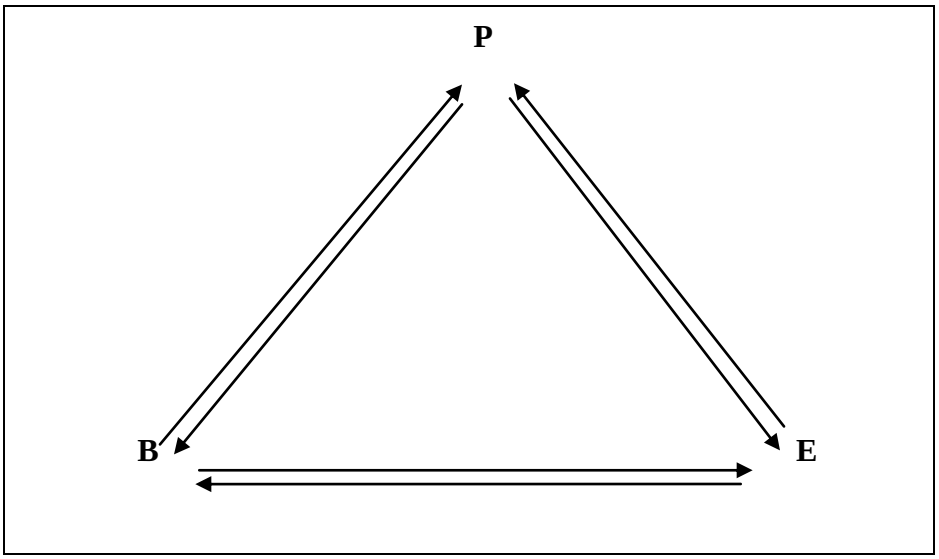

Figure 2. Bandura's Triadic Reciprocal Causation: Schematization of the relations between the three major classes of determinants in triadic reciprocal causation. *B* represents behavior; *P* the internal personal factors ('intrapersonal') in the form of cognitive, affective and biological events; and *E* the external environment (Bandura, 1986).

and is influenced by personal factors and the social environment. As such, "Social cognitive theory rejects a duality between human agency and social structure" (Bandura, 2000, p.164).

Bandura (2006) explained that, "Social systems are the product of human activity, and social systems, in turn, help to organize, guide, and regulate human affairs" (p. 165). However, within societal structures also exists a dynamic interplay with considerable personal variation (Bandura, 2006). As a result, there is variation from individual to individual regarding the "interpretation of, adoption of, enforcement of, circumvention of, and opposition to societal prescriptions and sanctions" (Bandura, 2006, p. 165). In other words, social cognitive theory essentially supports the idea that one's behavior is determined or influenced by the external environmental *as well as* one's ability to think and act for herself (given realistic limitations).

Social cognitive theory and the concept of triadic reciprocal causation was particularly useful in my examination of what contributed to the successful career advancement of women of color STEM faculty because it identified three major influences on human functioning: the

external environment, intrapersonal factors, and behavior. The importance of the reciprocal interactions between these influences should not be understated. However, the objective of this study was not to focus on triadic reciprocal causation, but to gain a deeper understanding of specific aspects that lie within each of the three determinants for the faculty studied, and to learn if, how and why these particular factors contributed to participants' career advancement.

Environment, Intrapersonal, and Behavior

For the purposes of this study, I examined specific aspects within *E*, the external environment, *P*, intrapersonal factors, and *B*, behavior. Within *E*, I explored areas of the faculty work-place (and climate, and culture to the extent possible). Within *P*, I closely examined the role of self-efficacy and personal agency to tenure and promotion. Within *B*, I focused on persistence and success strategy behaviors **(Figure 3).**

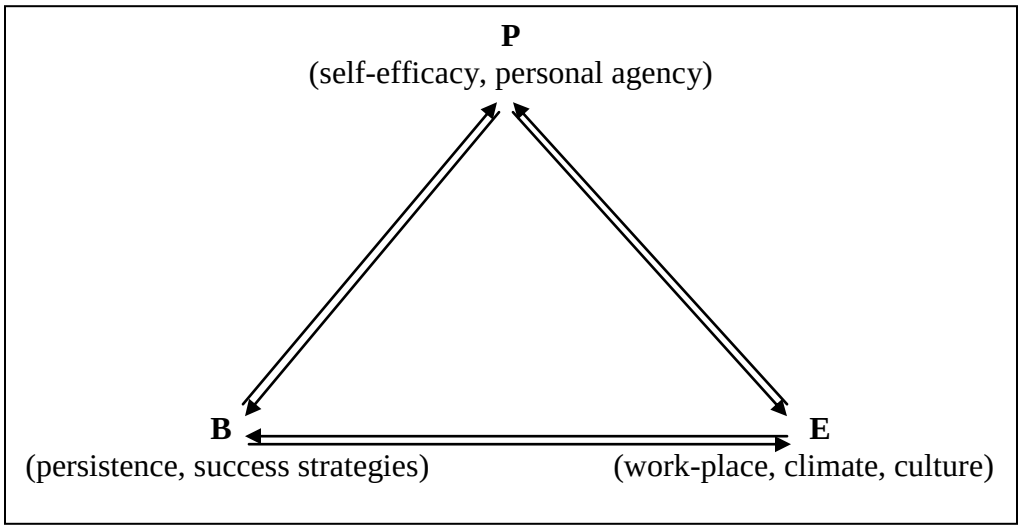

Figure 3. Specific Foci Within Environment (E), Intrapersonal (P), and Behavior (B): This study focused on particular aspects of the external environment (*E*, faculty work-place, climate, and culture), of intrapersonal factors (*P*, self-efficacy and personal agency), and of behavior (*B*, persistence and success strategies).

Environment. For *E*, the external faculty work-place environment, I explored features of work-place collegiality, employment equity, flexibility, professional growth and to a limited

degree, academic freedom and autonomy. These aspects pertained to the external faculty work environment for each participant. Gappa et al., (2007) asserted that these five essential elements are important characteristics of faculty work and work-places, regardless of faculty appointment type. For each of the five essential elements, my definition of terms was guided by Gappa et al.'s (2007) definitions:

- Collegiality: within the departmental context, faculty members having a sense of belonging "to a mutually respectful community of colleagues who value their unique contributions to their institutions and who are concerned about their overall well-being" (p. 142)
- Employment Equity: as "the right of every faculty member (regardless of appointment type or time base) to be treated fairly in regard to all aspects of his or her employment by the institution and its departments, to have access to the tools necessary to do his or her job, and to have status as a fully fledged, albeit necessarily different, member of the faculty" (p. 140)
- Flexibility: "the ability of faculty members to construct work arrangement to maximize their contributions to their institution as well as the meaningfulness of their work and personal lives" (p. 141)
- Professional Growth: "opportunities that enable faculty members to broaden their knowledge, abilities, and skills, to address challenges, concerns, and needs, and to find deeper satisfaction in their work" (p. 141)
- Academic Freedom and Autonomy: "the right of all faculty members to freely express their views in research and in the publication of results, in the classroom in discussing

their subjects…and the right of all faculty members to make decisions autonomously about how to perform their assignments" (pp. 140- 141).

Intrapersonal. Bandura (1998) highlighted internal personal factors in the form of cognitive, affective, and biological events. While I was alert to any references to a variety of such events as I interviewed faculty, I concentrated on the cognitive factors of self-efficacy and personal agency.

Self-efficacy. Hackett and Betz (1981) first proposed Bandura's (1977) original self-efficacy theory as an important theory to include in models of career development. In particular, the authors emphasized the relevance of self-efficacy to women's career development in male-dominated scientific and technical careers (Betz & Hackett, 2006). Today, self-efficacy theory is not only viewed as a key concept to understand general career development, but also as a key idea relevant to understanding the career development of specific groups, such as people of color (Betz & Hackett, 2006).

Self-efficacy is defined as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994, para. 1). Self-efficacy is *not* a trait concept but rather a cognitive appraisal or judgment of future performance capabilities (Betz & Hackett, 2006). Further, self-efficacy should not be confused with the term confidence, because "confidence is a nondescript term that refers to strength of belief but does not necessarily specify what the certainty is about" (Bandura, 1997, p. 382).

Instead, self-efficacy is behavior-domain specific (Betz & Hacket, 2006). An individual's self-efficacy is in relation to something; a researcher's assessment of self-efficacy is also in relation to a specific behavior-domain. For example, I am interested in the promotion and tenure efficacy of women of color in STEM. Therefore, I "need to inquire about the learning

experiences relevant to the development of" (Betz, 2007, p. 404-405) strong promotion and tenure self-efficacy expectations by individuals in my study, "including indices of choice, performance, and/or persistence in math-related…careers" (Betz, 2007, p. 404-405). Efficacy beliefs determine the choices that individuals make at important decisional points and determine:

> …the courses of action people choose to pursue, how much effort they put forth in given endeavors, how long they will persevere in the face of obstacles and failures, their resilience to adversity, whether their thought patterns are self-hindering or self-aiding, how much stress and depression they experience in coping with taxing environmental demands, and the level of accomplishments they realize. (Bandura, 1997, p. 3)

In essence, the stronger one's perceived self-efficacy, the higher the goals they set for themselves and the less wavering they are in their commitment to those goals (Bandura, 1989). People's self-referent belief determines their level of motivation to a specific endeavor and influences the types of anticipatory scenarios they construct—"those who have a high sense of efficacy visualize success scenarios that provide positive guides for performance" (Bandura, 1989, p. 1176).

According to Betz and Hackett (2006), the development of self-efficacy for a given behavior-domain stems from four background learning experiences, otherwise known as the 'four sources': *performance accomplishment* (successful mastery experiences/past performance accomplishments relevant to the behavior-domain), *vicarious learning* (having role models or observational models), *physiological and affective states* (ability to handle emotional states or moods e.g., anxiety, stress, tension), and *verbal persuasion* (receiving encouragement, positive appraisal).

One's self-efficacy regarding a particular activity, in turn, influences three major outcome behaviors: *approach versus avoidance, level of performance,* and *persistence* (Betz, 2007). The illustration below **(Figure 4)** is adapted from Betz's (1992) article, *Counseling Uses of Career Self-Efficacy Theory;* the author titled this illustration "Bandura's Model of Perceived Self-Efficacy." As shown in the diagram below, the left side identifies the four sources of background/experiential information described above as the 'four sources'. The right side of the diagram reflects "the consequences of perceived self-efficacy" (Betz, 1992, p. 1). This diagram indicated that one's perceived self-efficacy in relation to something results in behavior such as approaching versus avoiding an activity, executing the activity, and persisting through the specific behavior-domain at hand.

Self-efficacy theory suggests that the 'four sources' and outcome behaviors are important and may be exhibited when studying the successful career development of individuals. Together with personal agency (discussed below), Figure 4 partly depicts how I conceptualized the "success" aspect of my study. That is, I hypothesized that early career women of color faculty in STEM would be able to persevere through work contexts that are not generally fully conducive to supporting them as a result of possessing self-efficacy in relation to attaining tenure. If certain outcome behaviors result, what follows is an individual's capacity to act. These actions are afforded through personal agency.

Personal agency. According to Bandura (2000), self-efficacy operates as a mechanism of personal agency; that is, self-efficacy is embedded in a theory of individual agency. "Social cognitive theory adopts an agentic perspective in which individuals are producers of experiences and shapers of events" (Bandura, 2000, p. 75). Personal agency can be understood as people being "contributors to their life circumstances, not just products of them" (Bandura, 2006, p.

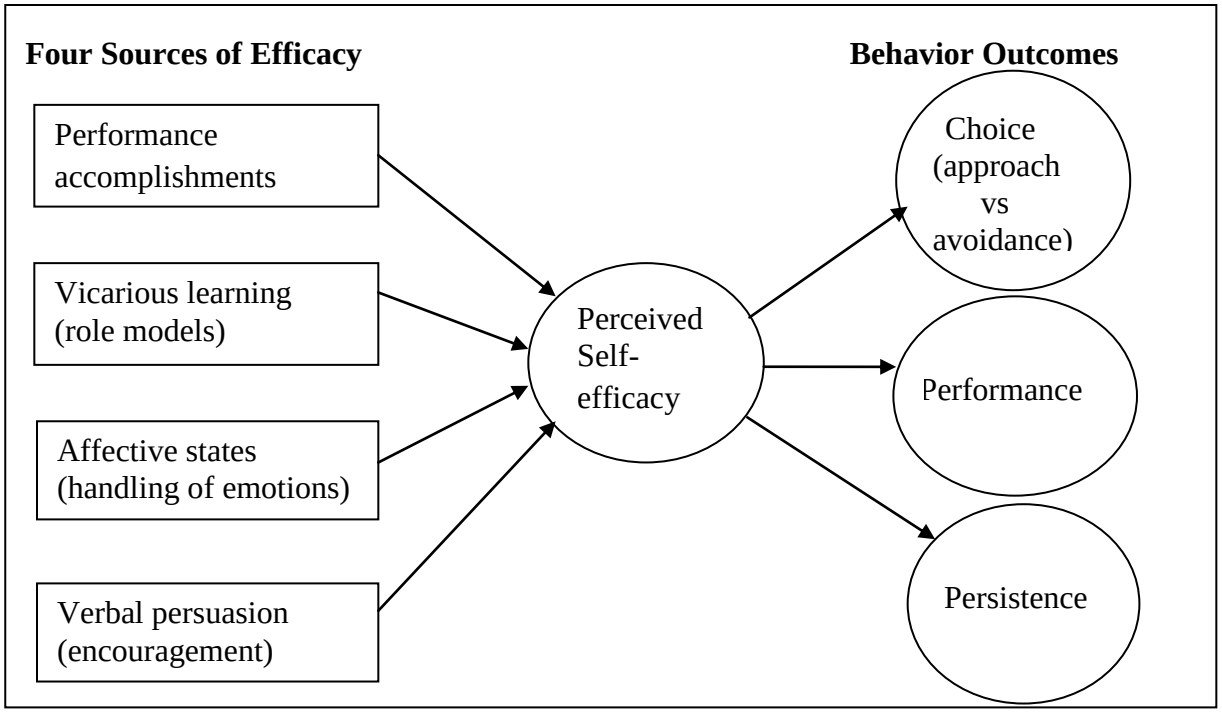

Figure 4. Four Sources of Perceived Self-Efficacy and Behavioral Outcomes: The four experiential sources of perceived self-efficacy are shown on the left side of the diagram. The right side of the diagram reflects three behavioral consequences of perceived self-efficacy.

164) or "simply onlookers of their behavior" (Bandura, 2006, p. 164). Bandura (2006) explained:

> Among the mechanisms of human agency, none is more central or pervasive than belief of personal efficacy (Bandura, 1997). This core belief is the foundation of human agency. Unless people believe they can produce desired effects by their actions, they have little incentive to act, or to persevere in the face of difficulties. Whatever other factors serve as guides and motivators, they are rooted in the core belief that one has the power to effect changes by one's actions. (p. 170)

The belief in one's ability to generate desired effects by individual action influences their resilience to adversity, vulnerability to stress, level of effort and perseverance, aspirations, and choices (Bandura, 1998). "Agency, thus, involves not only the deliberative ability to make

choices and action plans, but also the ability to construct appropriate courses of action and to motivate and regulate their execution" (Bandura, 2006, p. 165).

Individual agency is characterized by four core properties: intentionality, forethought, self-reactiveness, and self-reflectiveness (Bandura, 2006). Therefore, in my study I kept alert to those properties of agency expressed by my study participants. *Intentionality* means that people deliberately "form intentions that include action plans and strategies for realizing them" (Bandura, 2006, p. 164). *Forethought* involves the temporal extension of agency. Bandura (2006) wrote:

> Forethought includes more than future-directed plans. People set themselves goals and anticipate likely outcomes of prospective actions to guide and motivate their efforts…But through cognitive representation, visualized futures are brought into the present as current guides and motivators of behaviors. In this form of anticipatory self-guidance, behavior is governed by visualized goals and anticipated outcomes, rather than pulled by an unrealized future state. (p. 164)

It is through forethought that individuals motivate themselves and guide or adjust their actions in anticipation of future events.

The third property of individual agency is *self-reactiveness.* Self-reactiveness encompasses one's ability to self-regulate and monitor his or her own progress toward fulfilling choices made, linking thought to action (Bandura, 2006). Thus, agents have the "ability to construct appropriate courses of action and to motivate and regulate their execution" (Bandura, 2006, p. 165). Finally, the fourth property of individual agency is *self-reflectiveness,* through which individuals reflect on the meaning of their pursuits, practice self-awareness, judge the correctness of their thinking against outcomes of their actions, and make corrective adjustments

if necessary (Bandura, 2006). Bandura (2006) stated that the metacognitive capability to reflect upon one's personal efficacy, soundness of thoughts, and meaning of pursuits, "is the most distinctly human core property of agency" (p. 165). Therefore, if self-efficacy is embedded in a theory of human agency, this concept may be visually represented as depicted in the following figure **(Figure 5)**. It must be noted, however, that there is no absolute individual agency because "most human pursuits involve other participating agents" (Bandura, 2006, p. 164). In fact, people do not operate as autonomous agents, nor are their behaviors entirely based on situational influences (Bandura, 2006).

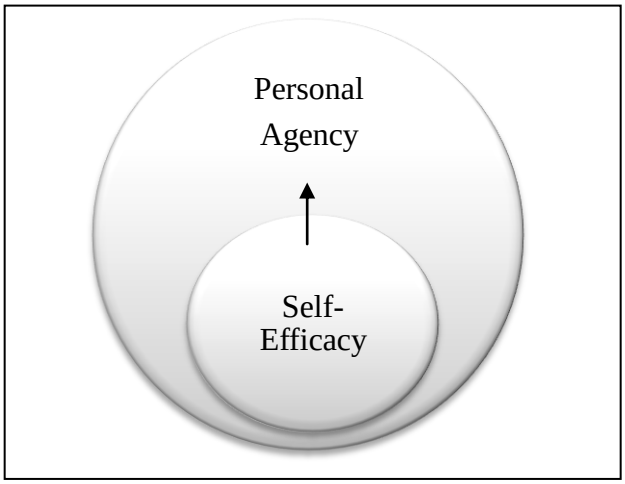

Figure 5. Self-Efficacy as a Mechanism of Personal Agency: Self-efficacy is embedded in a theory of personal agency. Among the mechanisms of agency, none is more central or pervasive than belief of personal efficacy.

In summary, my conceptual and theoretical framework guided my thinking in the following way: the faculty development literature assisted my ability to probe and explore potential challenges faced by early career women of color in STEM as cited in the literature. Social cognitive theory and triadic reciprocal causation offered a model for understanding the interactions of three determinants that contribute to human functioning (environment, intrapersonal factors, and behavior).

Within this model, Gappa et al.'s, (2007) five essential elements assisted me in probing deeper into specific aspects of faculty's work-place external environment, while self-efficacy and personal agency allowed me to focus more closely on the cognitive processes involved in the intrapersonal factors. I then focused on persistence and strategy behaviors implemented by faculty to overcome challenges they faced amidst the promotion and tenure process. Ultimately, both the overview of human functioning offered by the triadic reciprocal causation model, as well as the analysis within each determinant for this study (essential work-place elements, self-efficacy, personal agency, and behavior), served as a guide to examine how and why my study participants were able to successfully persist through challenging personal, organizational, and disciplinary promotion and tenure contexts at predominately White, research institutions.

A Critical Lens

Agency, a Critical Lens

Although Bandura (2006) wrote that personal agency is not simply a matter of free will, he also stated that because "judgments and actions are partly self-determined, people can effect change in themselves and their situations through their own efforts" (p. 1175). Thus, while I focused quite a bit on Bandura's theory of personal agency through self-efficacy to guide my study (together with faculty development literature), due to the centrality at the intersection of race, gender, and science of my participants, I also kept in mind a third theoretical dimension--*critical agency* in my interviewing and analysis, as outlined below.

Baez (2000), who conducted a study on race-related service and faculty of color, wrote, "one must account in theorizing about the experiences of faculty of color the interplay between agency and social structures" (p. 385). Baez (2000) asserted, "I redefine agency, not as free will, but as *actions that are possible within the context of disciplinary power*" (p. 385). Baez (2000)

further speculated on the complex link between "structure, resistance, power, and agency" (p. 385) to provoke alternative ways in thinking about the experiences of faculty of color within the promotion and tenure process. Similarly, with respect to speaking about the relationships between social justice, women of color, agency and structure, Collins (2000) stated that the world is viewed as a:

> …dynamic place where the goal is not merely to survive or to fit in or to cope; rather, it becomes a place where we feel ownership and accountability. The existence of Black feminist thought suggests that there is always a choice, and power to act, no matter how bleak the situation may appear to be (p. 290).

Similar to Bandura (1998; 2006), Baez' (2000) and Collins' (2000) position was that within social structures, people possess the ability to make choices that can be transformative. Unlike Bandura, however, Baez and Collins brought forth the dimension of racial and power dynamics and considered its role in agency for people of color. Basu, Barton, Clairmont & Locke (2009) also conveyed the importance of an awareness-action cycle to critical agency. They wrote, "learning to work against oppression involves a process of understanding the effects of oppression and leveraging resources to act against it" (Basu et al., 2009, p. 355). Citing works by Freire (1970) and Butler (2004), Basu et al. (2009) captured a more political and social justice orientation to agency: "Vital to this awareness-action cycle is the process of resisting social norms by locating them as cultural rather than normative as well as learning how to enact resources to uncover oppression and recover from it" (p. 355).

It was important to keep alert to a critical agency perspective because many women of color faculty in academe have expressed such positionalities. One example is provided by

Balderrama, Texeira, and Valdez (2006) who, in capturing the experience of a Mexican-American female faculty in their study, noted the participants' remarks:

> Social responsibility became and has remained a priority in my personal and professional life. By social responsibility I mean a sense of altruism, or duty, to do my part in addressing and interrupting inequity, unfairness, injustice, and inhumanity in their various forms…That is, I attempt to pursue actively ways to undo our…history of economic and political subordination. My motivation for entering academia was and has remained constant, clear, and unchanged. (p. 221)

Thus, in addition to the traditional elements of personal agency, it was important for me to keep in mind a critical agency lens because of its potential relevance for my participant group.

Self-efficacy, a Critical Lens

In addition to keeping alert to critical agency aspects, I also remained aware of gender-related nuance regarding traditional self-efficacy theory. In at least two self-efficacy based qualitative studies on women in STEM careers, Zeldin and Pajares (2000) and Zeldin, Britner, and Pajares (2008) found that social persuasion and vicarious experiences were critical sources of self-efficacy beliefs for women in male-dominated domains over mastery experiences. In contrast, traditional self-efficacy tenets assert that "mastery experiences produce stronger and more generalized efficacy beliefs than the other modes of influence" (Bandura, 1998, p. 54) and that, "the most effective way of instilling a strong sense of efficacy is through *mastery experiences*" (Bandura, 1998, p. 53). Zeldin and Pajares (2000) argued that women's self-efficacy development may differ from patterns suggested by traditional theoretical tenets for women who develop careers in male-dominated domains. Zeldin et al. (2008) explained:

> Women consistently recalled experiences that involved an influential person, often during

> a critical time, who helped them develop their beliefs about the capabilities while they also developed their competencies. The vicarious experiences influence both their ideas regarding STEM careers and their philosophies about women in male-dominated domains. Although these women recalled obstacles such as negative social messages about themselves and about their career pursuits…their experiences with positive messages and models proved more influential in their pursuit of STEM careers. (p. 1039)

Much is yet to be explored regarding potential gender differences and the development of self-efficacy of those who pursue careers in male dominated fields (Zelding et al., 2008). However, these studies brought attention to the potential difference in self-efficacy formation for women who pursue careers in male-dominated fields—such as my study participants. Therefore, in addition to keeping alert to a critical agency perspective by my participants, I also remained attentive to gender nuances within a self-efficacy perspective.

What all this leads to is explaining how the faculty development literature and social cognitive theory, with a focus on the role of self-efficacy as a mechanism of personal agency, served as a conceptual and theoretical framework that helped to guide my study. As noted previously, I kept aware to critical aspects of agency and self-efficacy, which suggests that critical agency and patterns of self-efficacy may differ for the women I am studying from what was suggested by the traditional tenets. I also remained actively open to all information that emerged from my participant interviews that did not necessarily align with my initial framework. Together, the perspectives that served as an initial base to inform my research pursuit are depicted below **(Figure 6)**. To clarify, I was not trying to test anything in regard to social cognitive theory, including triadic reciprocal causation, self-efficacy, or personal agency. Rather,

I was informed by these theories to help me identify issues and categories that I needed to probe and explore.

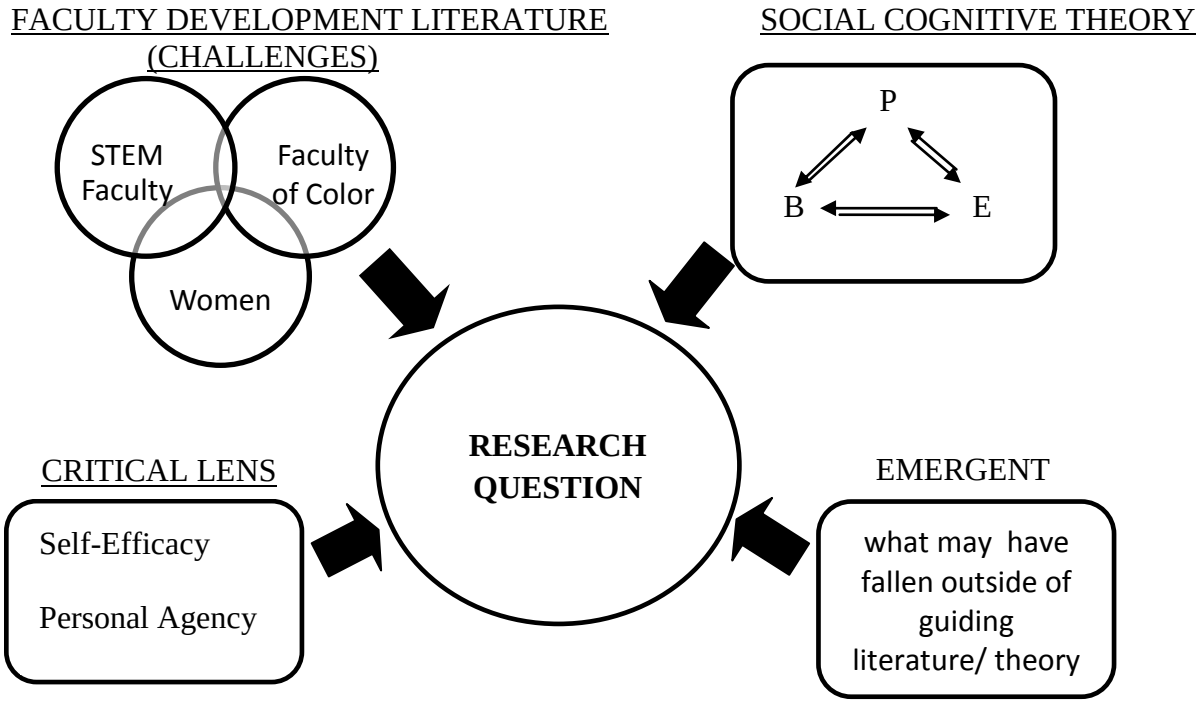

Figure 6. Guiding Conceptual and Theoretical Framework: Early career challenges faced by women of color in STEM from the faculty development literature; social cognitive theory where *E* is environment (work-place, five essential elements), *P* is intrapersonal (self-efficacy, personal agency), and *B* is behavior (persistence, success strategies); a critical lens was used for self-efficacy and personal agency; and category 'emergent' represented emergent aspects that may have fallen outside of the guiding literature and theories.

Thus far, I put forth the guiding conceptual and theoretical foundation of my study. Next, I addressed the research paradigm that served to further interpret my study. Following my research paradigm is my methods section.

Research Paradigm

This study was qualitative in nature and was framed within a social constructivist paradigm. A central *purpose* for research within a constructivist paradigm is to understand; a

main *assumption* is that reality is socially constructed through channels of complex and interwoven variables; and a main research *approach* is a search for patterns with minor use of numerical indices (Glesne, 2011). This framing was particularly appropriate because social cognitive theory, a main theoretical perspective that was used in this study, takes a constructivist approach to career development (Lent, Brown, & Hackett, 1994). Individuals actively construct their own meaning of interaction with environmental events; they are proactive shapers of circumstance, not onlookers to external forces (Bandura, 2006).

I was interested to know how women of color faculty in STEM interpret and make meaning of specific events (e.g., "personal, disciplinary, and organizational challenges faced along the promotion and tenure process"), their perceptions of those events, and how their interpretation(s) resulted in taking specific actions to overcome them. A constructivist paradigm allowed me to access "the perspectives of several members of the same social group about some phenomena [that] can begin to say something about…patterns of thought and action for that group" (Glesne, 2011, p. 8). Given my research paradigm, the methods most appropriate for my study allowed me to interact with individuals and discuss their perceptions with them in their social context (Glesne, 2011). Qualitative methods support this mode of inquiry. According to Glesne (2011), qualitative methods allow me to explore my main research question in the following manner:

- in-depth, and with interactions with "relevant people in one or several sites" (p.8);
- with a hypothesis (here, a guiding framework), but remaining "exploratory" and with an "open mindset to the variety of perspectives and issues that might arise" (p. 8);
- ability to ask questions of my participants;

- looking for patterns in my analysis, without reducing the multiple interpretations to numbers, "nor to a norm" (p. 8);
- being descriptive in nature for my final write up.

Quantitative methods do not offer the opportunity for rich description, and since self-efficacy theory has been overwhelmingly quantitative in nature, self-efficacy theorists have called for deeper insights that come from qualitative research (Zelding & Pajares, 2000). Thus, I conducted a qualitative interview study with thematic analysis (described in my methods section), based on a constructivist paradigm.

This section has provided a brief overview of the research paradigm and the mode of inquiry that guided the wider conceptions of my qualitative study. The following section is a review of the specific qualitative methods that I used in my dissertation.

Methods, Data Collection and Data Analysis

Methods

The primary method that I used in this study was interviews followed by a secondary method of taking analytic notes. I also utilized a short online questionnaire to collect demographic data from those who participated in this study.

Interviews. Qualitative data can be produced from interviews, where "interviewing is a basic methodological tool in qualitative research" (Remler & Van Ryzin, 2011, p. 62). Qualitative interviews involve a researcher asking open-ended unstructured or semi-structured interview questions "that allow people to respond in their own words and that encourage detailed and in-depth answers" (Remler & Van Ryzin, 2011, p. 63).

For my study I used an open-ended, semi-structured interview protocol that was shaped by my conceptual and theoretical framework **(Appendix A)**. Remler and Van Ryzin (2011)

stated that, "a semi-structured interview guide is a set of open-ended questions, sometimes accompanied by probes **(Appendix B)**, that help guide or structure the discussion. It helps ensure that each interview covers substantially the same topics, although the guide is meant to be a flexible tool and not a standardized script" (p. 64). Open-ended probing supports proper qualitative interviewing protocol for in-depth, qualitative interviewing.

I began each interview by asking the participants about the path that led them to their first tenure-track position, followed by questions that gave me a sense of their work-environment, culture, and context. Next, I probed about what challenges they faced as early career STEM faculty members, and inquired about their strategies of persistence and success. I typically ended each interview by asking each participant about advice she would give to future STEM women of color faculty and lessons learned, and provided her with an opportunity to add anything that was not covered during the interview. Furthermore, I made every effort to develop and maintain a strong level of rapport and trust with my participants throughout the interview process because Glesne (2011) asserted that, "qualitative research should move in a direction in which trust is needed for working together on the issue under inquiry" (p. 141).

Glesne (2011) also wrote about the hierarchical nature of the interview process. She noted that "how much [a researcher] works to make relationships less hierarchical depends on [the researchers'] philosophical and theoretical positions and on the research purpose, topic, and desires of research participant" (Glesne, 2011, p. 127). Due to my position as a graduate student and the fact that I interviewed tenured faculty members, I remained aware of power and hierarchy in my qualitative interview interactions and in my line of questioning.

Analytic notes. Interviewing is not simply devoted to data recording. "It is also a time to consider relationships, salience, meaning, and explanations—analytic acts that not only lead to

new questions, but also prepare you for the more concentrated period of analysis that follows the completion of data collection" (Glesne, 2011, p. 122). Thus, in addition to conducting interviews, I also engaged in analytic note taking using a research journal in digital as well as in handwritten format. Even though keeping analytic notes is most often associated with participant observation methods, I found it useful for my study and adapted this method to complement my participant interviews.

After each interview, I took time for reflective and analytic noting. Glesne (2011) stated that analytic noting is the time for researchers "to write down feelings, work out problems, jot down ideas and impressions, clarify earlier interpretations, speculate about what is going on, and make flexible short- and long-term plans for the days to come" (p. 76). Analytic noting was tied into my data analysis procedures (described in the following sections), and contributed to my study in many ways, including ways suggested by Glesne (2011): (a) problem identification, (b) question development, and (c) understanding the patterns and themes in my work. The reflective questions that I asked myself (and answered) for my analytic notes are found at the bottom of Appendix A. I also allowed myself to write freely as thoughts came to me in connection with the data.

I practiced analytic note taking, reflecting on the information and making connections between data sets, from the interviewing phase up until I wrote my final result. I frequently kept my hard copy journal handy during the data collection and analysis phase of my dissertation because reflective and analytic thoughts came to me not only during or immediately preceding interviews, but at other times outside of blocked interview appointment times.

Demographic questionnaire. A type of survey instrument used to collect data is a written instrument, such as a self-administered questionnaire (Mitchell & Jolley, 2010). A self-

administered questionnaire is one that is filled out by participants without the presence of an investigator (Mitchell & Jolley, 2010). In my study, I utilized a web-based self-administered questionnaire to collect basic demographic information from my study participants **(Appendix C)**. The interview protocol, described below, provides further detail about the questionnaire.

Thus far, I have stated my research question and have reviewed my conceptual and theoretical framework. I also presented a brief overview of my research paradigm, my primary modes of inquiry, and the qualitative methods that I used. Below, I have described the data collection and data analysis procedures that I followed.

Data Collection

This section provides an overview of the data collection procedures that I used in my study: participant selection, site selection, and the interview protocol. I have included a limitations section at the end of this chapter to identify the shortcomings of this dissertation.

Participant selection. The unit of analysis for this study was the individual. Although I interviewed a total of 17 participants, the total number of participants included in the final analysis was limited to 13 due to three incomplete interviews and one corrupted file. I accessed participants by utilizing a purposeful snowball and network sampling technique.

As highlighted in chapter one and two, tenured Black women and Hispanic/Latina faculty in the STEM fields remain relatively low across US institutions, particularly at predominately White, research universities. As a result, participants for my study were best accessed through a purposeful snowball and network sampling. "Snowball, chain, or network sampling…obtains knowledge of potential cases from people who know people who meet research interests. Snowball sampling is useful for getting started when you have *no other way* to find the participants you want…" (Glesne, 2011, p. 44-45).

In purposive sampling, people are chosen for a specific purpose, where the number of people is "necessarily limited because of the more intensive, time-consuming character of qualitative data collection and analysis" (Remler & Van Ryzin, 2011, p. 58). Qualitative research "most often involves purposive sampling…and a "small *n*" (Remler & Van Ryzin, 2011, p. 58), such as in this case of n=13. In purposive sampling, people are chosen for a specific purpose, and participants hold certain characteristics related to the research questions (Lincoln & Guba, 1985). For my study, individuals qualified to participate if they met the following criteria:

- self-identified as female Black and/or Hispanic/Latina US citizen or permanent resident;
- successfully achieved promotion and tenure, from assistant to associate rank, in a full-time, tenure-track position at a predominately White, research university (RU/VH or RU/H) in an academic STEM field

Methodologically, the benefit of including participants across a wide range of STEM disciplines was the opportunity to capture a variability of experiences and a variety of challenges and strategies that otherwise may not have been identified had the focus only been on individuals from one disciplinary area (e.g., physics).

There were several avenues of pursuit regarding my purposeful snowball and network sampling efforts. This included, but was not limited to, circulating a number of formal email requests to professional colleagues **(Appendix D**, example**)**. I attached two documents to each email request: a call for participation **(Appendix E)** and a dissertation project summary **(Appendix F)**. Professional colleagues included individuals whom I had met at professional conferences, those with whom I had worked previously, and individuals who may have met the

participant eligibility criteria directly. Other avenues for participant recruitment included posting formal requests on list serves and social media sites of relevant professional organizations.

Intense recruitment efforts were exerted for three-and-a-half to four months before a total of 17 participants were interviewed. As previously noted, three of the participants were not able to complete the interview and were not included in the final analysis. Due to the limited number of participants who fit my eligibility criteria, I encountered difficulty in recruiting and securing participants. Further, because of the relatively low number of current tenured Black women and Hispanic/Latina STEM faculty members at US research universities, I remained especially sensitive to conserve the confidentially and identification of the study participants. Not only did each participant self-ascribe a pseudonym, all potentially identifiable information was modified (e.g., institution names, department names, specific research topics, program names, the names of any individuals mentioned, city/state names etc.).

From this point forward, I refer to information pertaining only to the final 13 participants included in this study. The final participant profiles consisted of seven Black faculty women and six Hispanic/Latinas. In terms of citizenship, 11 self-identified as being US citizens and two as US permanent residents.

At the time of interviews, six participants were at the rank of full professor and seven were at associate rank. Twelve of the 13 participants were in full-time tenure track positions as junior faculty members. Of these 12 who were in full-time tenure track positions, 10 were granted promotion *with* tenure, one received promotion *without* tenure, and it remained unclear whether one participant received promotion with or without tenure due to a conflicting statement. Finally, there was one participant who was in a non-tenure track position as a junior faculty

member. This non-tenure track participant later entered a tenure track position as a promoted associate professor without tenure, where she then gained tenure as an associate professor.

Seven out of the 13 participants were in the academic fields of engineering, four were in science, one in technology, and one in mathematics. I have provided further text related to the participant profiles, including a chart that summarizes this basic demographic information at the beginning of the next chapter (Chapter 4: Results).

Site selection. Due to the nature of snowball sampling combined with a restricted participant eligibility pool, it was not possible for me to restrict site selection to one particular institution or US geographic region. The institutional locations included in my dissertation were from the West, Southwest, Midwest, Southeast, and Eastern regions of the US. Eight of the institutions included in this study were classified as RU/VH universities (research universities with very high research activity); five were classified as RU/H (research universities with high research activity). All institutions were public and predominately White with the exception of one, which was a private and predominately White institution. While there was variation regarding the specific profile of each institution, they were all research university work-places and environments.

I have acknowledged that academe has a certain culture that all early career faculty must become familiar with (e.g., as opposed to working in industry or another sector type). In addition to the broader work-place environment of a higher education setting, junior faculty must become fluent in their institutional, departmental, and disciplinary specific cultures and climates. Since I interviewed women across several institutions, I remained sensitive to the particular sub-cultures and climates in which they were situated in the time of their probationary status and to any differences in these organizational, departmental, and disciplinary environments. These

contextual nuances were captured through the interview protocol. I also remained cognizant of the possibility that my participants may have been shaped by their distinct work climate and cultures at the time of their tenure from assistant to associate status.

It is most important to understand that I studied individual women in university settings. Culture and climate was not the focus of my study. Instead, I was most interested in theoretical perspectives that helped me understand how individuals functioned and thrived in challenging situations. The literature on early faculty career development and the theories on self-efficacy and personal agency helped me think about that.

Interview protocol. Once I secured participants, I conducted one 90-120 minute telephone interview with each person. Two days to two weeks prior to the start of each scheduled interview (pending scheduling details), I emailed each participant a confirmation email that contained: (a) a phone interview appointment confirmation; (b) an attached research study consent form **(Appendix G)**; and (c) a link to a Qualtrics software powered online demographic questionnaire. I requested that each participant complete and submit the short demographic questionnaire at least 24 hours prior to the start of the scheduled interview in an effort to allow me sufficient time to review their basic information properly and thoughtfully as I prepared for the interview. Two individuals were unable to submit their online questionnaires. One person did not see the survey link, the second person cited time constraints. In these two cases, I collected the survey information by phone prior to the recording of our interview and hand wrote their responses onto a copy of a blank printed questionnaire.

I then called each participant from a private location at a phone number they requested that I dial. I thanked participants for agreeing to the scheduled phone interview, and briefly reviewed my study's purpose. Prior to the start and recording of each telephone interview, I

ensured that each participant had received my study consent form. I asked participants if they had read the consent form, as the interview could not have proceeded without their having read it. Participants verbally consented that they had received the consent form from me, and had read it.

I reviewed the consent form briefly, and focused on ensuring that participants understood and felt comfortable with the confidentiality agreement. Before proceeding, I asked participants if they had any questions about the consent form or about the study itself. If they had any questions or concerns, I addressed them at this time. Per Michigan State University Institutional Review Board protocol, I then asked participants for their formal consent to record and conduct the interview. Once participants gave me their consent to record and conduct the interview, I turned on my digital recorder, and the interview ensued.

I began by reviewing select questionnaire responses with each participant. The purpose of reviewing the questionnaire with the participant was twofold: first, to ensure that the online information I had received and interpreted was correct and accurate. Typically, I double-checked the following written responses with the participants: preferred pseudonym, tenure year, institution type, department, race/ethnicity, and citizenship status. Reviewing select responses also served as a warm-up to the main interview protocol.

Again, my open-ended, semi-structured interview questions were informed by my conceptual and theoretical framework. However, I allowed for unanticipated questions to emerge in the course of interviewing that added or replaced pre-established ones (Glesne, 2011). I took hand-written notes during the interview and answered a set of post-interview questions once the interview concluded.

After the recorder was turned off, I asked each participant if there were any actions they would like for me to take, beyond what was stated in the consent form, regarding ensuring confidentiality and privacy of their statements. For those who indicated additional measures, I recorded a note of their request and abided by it. At the conclusion of each interview, participants were emailed an online $20 gift certificate to Amazon.com to show my appreciation of their time.

Each participant interview file was labeled with a pseudonym and a randomly generated case number from Qualtrics software. This labeling scheme was reflected on interview notes, analytic notes, all saved digital files and printed questionnaires. All recorded interviews were initially saved on a digital recorder, then downloaded to an external hard drive and flash drive immediately. The external hard drive and flash drive were then stored in a secured and locked filing cabinet. No interviews were saved onto my computer hard drive at any time.

It should be noted that I piloted interviews using a test protocol with three individuals before finalizing my protocol and before interviewing participants for my study. The purpose of this was strictly to check the length and flow of my protocol and to ensure that my interview questions were framed in a manner that elicited a productive interview.

Data Analysis

Thus far, I have provided an overview of my research question, my conceptual and theoretical framework, research paradigm, methods, and data collection procedures. Next, I describe my data analysis procedures.

According to Remler and Van Ryzin (2011), there are three main steps involved in qualitative analysis: "preparing and organizing the data; reducing and summarizing the data, possibly through a process of coding; and presenting the data in narrative form, figures and/or

tables" (p. 75). I followed these three basic steps, in addition to early data analysis. This section covered my data analysis plan which included: transcription, early data analysis, coding, and thematic analysis.

Transcription and early data analysis. Transcribing each of my digitally recorded participant interviews served two purposes: (1) it allowed me to conduct content analysis later in the process, and (2) it served as a way for me to engage in early data analysis. Early data analysis is "done simultaneously with data collection" (Glesne, 2011, p. 188).

After initial transcription was completed, I listened to each digitally recorded interview as I followed along reading the typewritten transcription. There were several purposes behind this activity. First, I used this opportunity to double check each transcript for accuracy in the content reported. Second, as I listened and read along, I de-identified all information that could have potentially led to the identification and privacy of the participant. At this time, I removed all institution, program, department, and personal names mentioned. I replaced all names with an appropriate generic and bracketed identification marker in the transcript. I also de-identified other telling information such as discipline, research topic/area and any information I felt could potentially compromise participant privacy.

Although the primary purpose of engaging in transcript checking was to check for accuracy and de-identification, this step also served as a way for me to obtain a general sense of the information I had received. It allowed me to listen and reflect on the data as they were coming in. At this stage, I casually recorded any ideas or patterns that came to mind, and summarized key points for each individual interview. Glesne (2011) asserted that consistently reflecting and organizing collected data leads to more profound results than viewing data analysis as a discrete step to be done after data collection.

Following this step, I read the full set of transcripts again, only this time they were de-identified and I did not follow along with the audio simultaneously. Upon reading each de-identified transcript, I proceeded to write a one to three page summary of each participant's interview. To guide my summaries, I also consulted my original analytic notes that immediately followed the original interview, as well as the notes I had taken from my initial sense making exercise described above. Once these early data analysis steps were completed, I began to move into a deeper sense making process.

Coding and content analysis. Qualitative researchers often code their data as a way to introduce a systematic way in which to analyze and interpret data (Remler & Van Ryzin, 2011). A coding scheme "is essentially the creation of variables" (Remler & Van Ryzin, 2011, p. 76). It can also be used without any quantitative analysis "as a way to facilitate interpretation of a body of qualitative data" (Remler & Van Ryzin, 2011, p. 76).

The development of my coding scheme was approached in three main ways. First, I began with a provisional coding approach where I generated a "start list" (Miles, Huberman, & Saldana, 2014, p. 77) of codes. A start list is "based on what preparatory investigation suggests might appear in the data before [the data] are collected and analyzed" (Miles et al., 2014, p. 77). According to Miles et al. (2014), not only is this approach appropriate for qualitative studies that build on or corroborate previous research, "provisional codes can be revised, modified, deleted, or expanded to include new codes" (p. 77).

Since my conceptual and theoretical framework was based on previous research and research literature, yet served only as a guide remaining open to emergent concepts, this approach was fitting. I then modified this provisional list based on reviewing my summarized notes and recorded patterns captured through the transcript checking and de-identification

process. Finally, I conducted a preliminary analysis. I randomly selected five transcripts and coded themes based on my provisional codes. Coding refers to "a process of tagging the text or other qualitative data using a system of categories" (Remler & Van Ryzin, 2011, p. 76). This time, however, I focused specifically on applying my codes and sought to see if new categories of codes emerged.

I then finalized the development of the codes, the definition of codes, alphabetizing the codes, and making final decisions on the abbreviation of codes and categories, as suggested by Creswell (2009). At this point, I began coding all of my transcripts with the code book developed up to that point. I continued to modify my codes when necessary until all transcripts were coded. Due to my small sample size, I coded by hand. After coding of all of the transcripts was completed, I analyzed the coded information and began to identify emerging themes.

Thematic analysis. Coding is an important aspect of thematic analysis. Given my research question and framework, I sought to identify themes that provided insight to the range of strategies used by women of color faculty to overcome obstacles faced during the promotion and tenure process. Having kept aspects of my guiding theoretical and conceptual framework in mind, thematic analysis helped me to identify themes related to how and why my participants were able to successfully persist through challenging work scenarios. Utilizing this analytical technique, "the researcher focuses…on searching through the data for themes and patterns" (Glesne, 2011, p. 187). In doing so, my particular approach to the analysis of the data heavily focused on the *frequency of responses* to determine what my findings were. I also remained alert to themes that did not fall within my framework.

Additionally, I employed the practice of constant case comparison. Constant case comparison taking on "the mindset of looking for how each of your cases vary in terms of such

things as events, participants, settings, or word use" (Glesne, 2011, p.187). Constant case comparison added another layer of analysis by allowing me to "select and compare extreme cases, look for aspects that st[oo]d out that [I] might not have noticed otherwise" (Glesen, 2011, p.187). It also allowed me to look for subtle differences in similar cases. For constant case comparison, I implemented what was suggested by Glesne (2011). Glesne (2011) stated:

> One way to help you make comparisons is to create tables in which you put cases—for example, in rows down the page and selected aspects you have coded across the top. In each corresponding cell, you would summarize the coded material, sometimes using parts of quotations, but keeping it short, at this point, focusing only on the main ideas. Comparing cells can begin to trigger questions about relationships of the aspects you have selected and send you back to your data or to making other kinds of comparison charts. (p. 188)

Although this is not a case study, I considered each individual a 'case' for the purposes of taking advantage of constant case comparison to help me delve deeper into the nuances of analysis. Before my analysis was complete, I engaged in a data trustworthiness and reliability measure through intercoder reliability.

As suggested by Marshall and Rossman (2011), I developed a definition for each code and enlisted a "blind" reviewer to cross-check for consistency in meaning and application of my data by asking the peer coder to apply the codes and their definitions to six of my de-identified transcripts. The peer coder was a first-year doctoral student in the field of psychology and was selected due to familiarity with qualitative research analysis and researching issues using conceptual and theoretical frameworks from the field of psychology. I provided the peer coder with my research question, information related to the context of my study, and a list of defined

codes. I instructed the peer coder to use the codes I had developed to the extent possible, but encouraged the peer coder to remain open to identifying additional codes, themes, and patterns as appropriate.

Upon completion, the peer coder and I compared and contrasted our individual results and immersed ourselves in deep conversation over a course of three sessions. We critically discussed three main aspects of the data: (a) the nature of information presented in the data, (b) where our codes, themes, and patterns overlapped based on our individual efforts, and (c) what distinct codes, patterns, and themes emerged between our individual efforts, and why. I modified and updated my analysis where necessary. From here, we engaged in fruitful conversation that ultimately led to a strengthening of my confidence regarding the relationship between the data and the results. I then determined my data analysis complete.

Reflexivity

An aspect of qualitative research that should not be overlooked is that of reflexivity, subjectivity, and positionality. *Reflexivity* typically involves a critical level of self-reflection. Based on works from Madison (2005) and Potter (1996), Glesne (2011) described that "researchers tend to discuss reflexivity by inquiring into either their own biases, subjectivity, and value-laden perspectives or into the appropriateness of their research methodology and methods, including concerns regarding data collected, interpretations made, and representations produced" (p. 151).

My experience as an underrepresented minority woman formerly in the sciences, in conjunction with my professional experience as an educational program administrator who focused on increasing minority STEM participation, has inspired my dedication to study the persistence of ethnic minority faculty women in STEM today. I am very aware of my personal

and professional experiences and while important, I do not wish to impose my perceptions and viewpoints onto my study or participants. Furthermore, as an individual with an intersecting racial, ethnic, and gender identity, I do not assume that my participants' position(s), experiences, or sense-making reflects my own in any way.

Also, it is important for me to reflect upon and acknowledge my subjective position(s) throughout my current research study. *Subjectivity* is often "equated with bias and seen as something to control against and to mitigate its influence on research" (Glesne, 2011, p. 151). My commitment to remaining cognizant of my personal biases, whether conscious or unconscious, were reflected in the use and critical review of my analytic notes throughout my study. This noting practice not only served to reflect on data collection and insights throughout the process, but it also helped me track my assumptions, my personal interests, positions, and any stereotypes and prejudices that I may have held. Glesne (2011) suggested that researchers should ask the following questions to identify some of these subjectivities: "what surprised you?"; what intrigues you?"; and "what disturbs you?" (p. 77).

As a woman of color who interviewed women of color, I also considered issues of positionality and embodiment in my research study. The term *embodiment* refers to fixed personal attributes (e.g., skin color, disability, age) that are "impossible or difficult to change" (Glesne, 2011, p.157), and that "affect, in conjunction with the socio-cultural-historical context, how we act in the world and how others respond" (Glesne, 2011, p. 157).

Unlike the embodied person, one's *position* includes characteristics that are both ascribed (e.g., ancestry, nationality) and achieved (e.g., educational level) (Glesne, 2011). *Positionality*, on the other hand, is the interplay or interaction between embodiment and position. Hay (2005) stated that positionality can be understood as a researcher's "social, locational, and ideological

placement relative to the research project or to the other participants in it" (p. 290). Since positionality is determined in relation to others, it is difficult for researchers to control their positionality, although it is possible for researchers to "make certain choices that affect those relationships" (Glesne, 2011, p 157). Finally, Glesne (2011) cited Patton's work (2002) that suggested, "each person is situated in a sociocultural context of embodiment and positions ('culture, age, gender, class, social status, education, family, political praxis, language, values') that interact and provides 'screens' for differing perspectives" (p. 159).

I have had the opportunity to critically reflect upon every aspect of my life throughout my doctoral program, but particularly in three courses: Gender and Power, Critical Race Theory, and History of Higher Education. I have considered factors such as my class, gender, sexual orientation, race, ethnicity, citizenship, epistemology, immigration status, religion, education, language, and how these fixed and ascribed characteristics make up my personal values and being. I feel comfortable with myself in what I do and do not represent, including the recognition of factors that leave me, at times, in positions of privilege, and at other times in disadvantaged positions.

I was at ease regarding the methodology and method types that I implemented in my research study, as well as the nature of the topic itself. My intention was to ground my interpretation of the data based on the experiences of the participants as accurately as possible. Furthermore, although I remained open to themes and explanations that fell outside of my conceptual and theoretical framework, to the extent possible I interpreted and represented this data as it related to the faculty development literature and to social cognitive theory. In thinking about the interplay of these factors—subjectivity, embodiment, and positionality—I remained

aware of the personal aspects that I brought to my work, in the interpretation of the data, and in representing it.

Limitations

Every effort was made to engage in this study in a manner that remained consistent with my original study design: to interview Black women and Hispanic/Latina associate level faculty who achieved promotion and tenure in the last fifteen years at a public, predominately White, RU/VH institution in science (physical or life science) and engineering. However, due to factors of snowball sampling and difficulty finding participants who fit my criteria and who were also willing to be interviewed, the below mentioned modifications to my original study design and data collection plans were made, and limitations introduced.

First, there was variation related to rank level of those who participated in my study. This varied in three ways: (1) individuals at two distinct rank levels participated in my study (current associate *and* full rank); (2) the number of associate rank level faculty interviewed (n=7) versus the number of full rank level faculty interviewed (n=6) differed; (3) the years in which participants were granted promotion to tenure from assistant to associate faculty also differed in time span (n=7 in the last ten years; n=6 in the last twenty years). These factors potentially introduced limitations related to memory bias, particularly from those participants who advanced from assistant to associate 20 years ago. Generational differences may have also been present. That is, the cultural work-place changes that have occurred for women and women of color over the last twenty years may have introduced a difference in experience for the participants.

Second, there was variation in institution type where participants achieved promotion and tenure. Eight were at institutions designated as RU/VH institutions (research universities with *very high* research activity), while five were at RU/H institutions (research universities with *high*

research activity) during their junior faculty years. This introduced a slight difference in terms of departmental promotion and tenure expectations. However, the representation of the two institution types was fairly balanced. Those in RU/H contexts tended to have a higher teaching load expectation than those at RU/VH institutions. Further, while research activities remained critical at both institutions, RU/VH institutions tended to place a heavier emphasis on research-related activities compared to RU/H institutions. Service expectations were about the same at both institution types. Further, all were public institutions except one, which was private. There were no obvious differences between the private and public institutions in terms of climate, culture, or promotion expectations.

Third, variation in faculty appointments and career advancement circumstances were a part of this study. All participants, with the exception of three individuals, received promotion *with* tenure. As indicated in the definition of terms ("Promotion and Tenure/Career Advancement"), this study assumed promotion *with* tenure in its use of the term promotion and tenure, or simply tenure, unless otherwise indicated. Here I address where the exceptions are, and use the terms promotion and tenure, or simply tenure throughout this dissertation *keeping in mind* that there were three exceptions to the participant profiles. To reiterate, the majority of participants, 10 out of 13, achieved promotion *with* tenure.

The exceptions were Isabel, Sally, and Jasmine. For Jasmine, it was unclear if she received promotion with or without tenure due to conflicting transcript data. All conversation was in reference to promotion and tenure minus one comment in reference to promotion "only". I choose to remain conservative in my assumptions and thus listed Jasmine as one who received promotion but not tenure.

Second, Isabel was in a non-tenure track position as an *assistant* professor. After a number of years in this position, Isabel was hired as an untenured *associate* level professor at a different institution into a tenure-track position. At this point, Isabel went through the tenure process for the first time and successfully attained tenure as an associate faculty. Later, she attained promotion to full.

A third participant, Sally, who was in a tenure-track position as an *assistant* professor, received promotion without tenure. Her situation was one of extreme negative politics and racism. In her situation, her file was pulled at the department level, never processed through appropriate formal channels, nor reviewed at the university level. Instead, Sally was offered a fixed term position as an *associate* faculty, even though her tenure case was never formally reviewed and denied. While Sally initially pursued legal action, she decided against that and continued for a short time as a promoted associate fixed term faculty before being hired at a different institution as a tenured associate professor. It remains unknown as to whether she would have made promotion *with* tenure at her first institution. From this point forward, reference of faculty having successfully attained "promotion and tenure", "tenure", or "career advancement" will knowingly include these three cases.

Fourth, the number of individuals who were in certain STEM fields over others was uneven. My participants included n=7 in engineering, n=4 in the sciences, n=1 in computer science, and n=1 in mathematics. This placed a heavier tilt in responses based on the experiences of engineers, versus those in science, technology, and mathematics. It was difficult to control this distribution based on a purposeful snowball and networking sampling technique.

It should also be noted that the number of Black women and Hispanic/Latinas interviewed was nearly even; however, there were slightly more Black (n=7) women faculty than

Hispanic/Latina (n=6) faculty who participated. Also, n=11 were US citizens and n=2 were permanent residents. This may have impacted how these individuals constructed meaning of their promotion and tenure experiences as women of color faculty in STEM at predominately White, research universities.

Finally, a general limitation of qualitative research involves "the trading off of the generalizability that comes with large, random samples for the ability to do more in-depth (thick) description and to select cases of theoretical importance" (Remler & Van Ryzin, 2011, p. 58). My objective was not to assert generalizations for all women of color STEM faculty who have succeeded, but to understand what contributed to the success of those who participated in my study.

In this chapter, I outlined the methodological approach and research design that I followed to conduct my study. Here, I also presented the statement of my research question, my conceptual and theoretical framework, and my research paradigm. Additionally, I detailed information of the following topics: methods, data collection, and data analysis procedures, reflexivity about this study, and a limitations section. Next, I report the results of this study.

CHAPTER 4: RESULTS

In this chapter I report the findings of my primary research question: *What contributes to the successful career advancement of women of color faculty in the fields of academic science, technology, engineering, and math?* To answer this question I interviewed faculty who successfully achieved promotion and tenure from assistant to associate rank status. The following overview provides further details of the study participants.

Overview of Participants

As presented in chapter three, the sample for this study consisted of 13 women in the academic fields of science, technology, engineering, and math. Great care has been taken in this dissertation to protect the identity of the study participants as illustrated in the table below. Protecting the identity of the participants is very important because there are relatively few Black and Hispanic/Latina tenured faculty in academic STEM fields at US research universities. Additionally, in the interview process several participants expressed concern that has required me to make choices in places where I might like to otherwise reveal more detail. However, I have chosen to be very protective of their identities as it is critical to guard their confidentiality.

Table 1 summarizes the demographic information of the study participants. Each participant self-assigned a pseudonym for this study, shown on the left hand side of the table. Continuing from left to right is the participant's self-identified racial category, labeled "Race." As indicated in Table 1, seven participants are Black and six are Hispanic/Latina tenured faculty. Among those who are Black, one participant has a different ethnicity than African-American. There are four different ethnicities represented in the Hispanic/Latina racial category. Even though the ethnicities and citizenship status of each participant were collected, they were not ascribed to the individuals to further conserve their confidentiality.

The majority of participants (10 out of 13) achieved promotion with tenure as indicated in the fourth column titled, "Promotion *with* Tenure." In the "Participant selection" portion of chapter three, I detailed the background of the three participants who were not classified as having attained promotion with tenure. Following the "Promotion *with* Tenure" category is the year that the participants were promoted from assistant to associate rank status, as indicated in the column marked, "Year." Seven participants attained tenure in the last 10-15 years, and six participants attained tenure more than 15 years ago.

The sixth column titled "Curr Rank" indicates the participant's current faculty rank status, that is, at the time the interview was conducted. Six participants were full professors and seven were associate professors in their respective fields. The "F/T Appt Type" column shows that 12 out of the 13 participants were in full-time tenure-track (TT) positions during their probationary years. One participant was in a full-time non-tenure track (NTT) position, also detailed in chapter three. The "US Loc" column indicates the US geographic location of the participants' institution at the time of their early career. The table depicts that the participants embarked in their pre-tenure positions at institutions located across the country.

Finally, the last three columns indicate the participants' academic STEM fields, the Carnegie classification of the institutions where the participants were employed as junior faculty, and the public versus private standing of their predominately White research university settings during their probationary years. Of the 13 participants, seven were academic engineers, four were life or physical scientists, one participant was a mathematician, and one participant was in the area of technology. Information about the participants' sub-disciplines and research activities was collected but was excluded from the table to conserve confidentiality. Eight participants were situated in RU/VH institutions (research universities/very high research

activity) and five in RU/H institutions (research universities/high research activity). Lastly, the furthest column to the right, designated "PWI Public or Private," indicates that 12 out of 13 participant were employed at a public, predominately White research university during their probationary years. One participant was employed at a private, predominately White institution.

#	Pseudo-nym	Race	Promotion *With* Tenure	Year	Curr Rank	F/T Appt Type	US Loc	STEM Field	CC	PWI Public or Private
1	Ava	Black	Yes	1990	Full	TT	W	Sci	RU/VH	Pub
2	Beyonce	Black	Yes	1990	Full	TT	SE	Eng	RU/H	Pub
3	Destiny	Black	Yes	1990	Full	TT	E	Sci	RU/VH	Pub
4	Jasmine	Black	Unknown	2004	Full	TT	MW	Eng	RU/VH	Pub
5	Isabel	Hisp/ Lat	No	1990	Full	NTT	SE	Eng	RU/VH	Pub
6	Flora	Hisp/ Lat	Yes	1996	Full	TT	SW	Math	RU/H	Pub
7	Maria	Hisp/ Lat	Yes	2010	Assc	TT	W	Sci	RU/VH	Pub
8	Olivia	Hisp/ Lat	Yes	2008	Assc	TT	W	Eng	RU/H	Pub
9	Engineering	Hisp/ Lat	Yes	2009	Assc	TT	SW	Eng	RU/H	Pub
10	Avignon	Black	Yes	2011	Assc	TT	W	Sci	RU/VH	Pub
11	Sweet	Black	Yes	2008	Assc	TT	NE	Tech	RU/VH	Pub
12	Sally	Black	No	2003	Assc	TT	SE	Eng	RU/VH	Priv
13	Ann	Hisp/ Lat	Yes	1997	Assc	TT	SW	Eng	RU/H	Pub

Table 1. Summary of Faculty Participant and Institutional Profiles: F/T Appt Type: TT= tenure-track and NTT = non-tenure track. US Loc: W= Western, SE= Southeast, E= East, MW= Midwest, SW= Southwest, NE= Northeast. CC (Carnegie classification): RU/VH (research universities/very high research activity) and RU/H (research universities/high research activity). PWI Public or Private: predominately White institution public (pub) or private (priv) standing.

To address my main research question, I explored two sub-questions with the respondents: a) What strategies did tenured Hispanic/Latina and Black women faculty in STEM

enlist to successfully overcome personal, organizational, and disciplinary-related challenges amidst the early career promotion and tenure process?, and b) What factors enabled them to persist through these challenges? This chapter organizes the findings from my research into two sections: challenges and strategies.

Section One: Challenges

While the probationary years proved to be a time of great productivity and achievement, these years were also full of obstacles that participants had to manage. The now-tenured faculty grappled with a number of challenges amidst their early career: (1) vague promotion and tenure expectations; (2) pressure to obtain external grants/publish; (3) managing work-life difficulties; (4) navigating a gendered and racialized academic landscape; and (5) service. I began by illustrating how participants were faced with conflicting, incomplete, or vague tenure requirements. Specific examples from participants are provided below.

Vague Promotion and Tenure Expectations

Twelve out of 13 participants wrestled to crystallize some facet of the promotion and tenure requirements expected of them. How quickly individuals were able to demystify such requirements or expectations varied, if they were able to clarify them at all. From the beginning, all participants understood that there were three performance areas in which they would ultimately be evaluated: teaching, research, and service. Initially, what was less clear to some of the participants waswhich of the three performance areas was valued the greatest for tenure. Before long, the majority of participants discerned that the performance area of research carried the greatest value, followed by teaching and service. For two participants it was research *and* teaching that carried the greatest value. Despite knowing the valued order of these performance areas, still, the path to tenure contained much ambiguity.

The participants cited a number of reasons that contributed to the particular challenge of vague promotion and tenure expectations. A general lack of clear requirements and expectations within each area of teaching, research, and service contributed to the participants' feelings of advancing to tenure somewhat blindly. Specifically, conflicting information, undefined requirements/expectations, and unwritten rules about the value of activities within each performance area were reported as contributors that resulted in this overarching challenge. Further, for the majority of participants a persistent issue was a lack of firm quantity markers for publication and grant dollars. Together, these four issues contributed to a feeling of moving toward tenure somewhat 'blindly' by the participants.

Maria provided an excellent example of how vague promotion and tenure expectations impacted her probationary years. Specifically, she highlighted how *conflicting information* posed an obstacle for her. She said:

> It's never something specific like, 'you have to have this many papers, and this many committees and this many teaching hours'… It's always something a bit more qualitative like 'achievements' in all three, or 'contributions' in all three. So depending on who I spoke to, I'd always get different numbers and different expectations. It was all vaguely about the same but it did make it a little difficult to really know what the expectations are. (Maria)

As illustrated below she also demonstrated how expectations can sometimes be stated, yet remain undefined:

> That being said, the expectations that were roughly laid out by my chair were…four to six research, primary research papers. Presence, whatever that means, presence in a [university] school course, and serving on campus committees. (Maria)

Maria was not the only faculty member who confronted the issue of receiving a set of *undefined expectations*. For instance, Destiny stated: "basically I was told that you just need to be a mediocre teacher. They're counting pubs…and they want you to get money…". Although Destiny learned that the expectation was to be a mediocre teacher, it was less clear as to what standards were used to define mediocre, for example. Destiny continued to explain that as a new assistant professor she did not know what the expectations were. At times, even if expectations were stated, some aspect inevitably remained unclear. Destiny concluded, "you really have to kind of work your way through with hopes that somebody will give you the correct advice" (Destiny).

Grappling with *unwritten rules* was a third obstacle reported. For example, Destiny knew that publication output and securing grant funds was important in her making tenure. Fortunately for Destiny, a colleague informed her that it was more than just publishing, but publishing in *certain* journals that were most valued for tenure. She recounted a tip-off that someone had told her: "You need to be able to publish in *this* journal …or *this* journal because this department, these are the ones that count. They don't care what else you do" (Destiny). It was through this experience that Destiny discovered an existence of unwritten rules regarding the value of certain activities. For Destiny it was not only an issue of a need to publish, but where to publish.

Maria also wrestled with the issue of unwritten rules. In her case, she learned that certain service activities were valued over other activities in her department. Even though Maria had obtained a rough quantity marker from her department chair regarding the number of publications she should aim for, it was happenstance that she learned about the weighted value given to two particular service committees for tenure. If it were not for her inquiring of her

colleagues about valued service, Maria would not have known that serving on the graduate admissions and dissertation/qualifying exam committees were "good committees to serve on for promotion and tenure" (Maria) because they were "looked upon favorably" (Maria) and were "widely recognized for promotion and tenure" (Maria).

Though not explicitly stated by her department chair during their conversation of expectations, Maria learned that these committees held meaning due to an understood value represented in her department. That is, serving on these two committees was looked favorably upon because they provided "…mentorship and teaching to graduate students…" (Maria). In Maria's case, she learned that there was a ballpark quantity marker for publications, that certain service activities were valued for tenure, and that "presence" in a university course was important.

Conflicting information, undefined expectations, and unwritten rules regarding the value of certain activities contributed to a sense of vague promotion and tenure expectations by the participants. A fourth issue was a lack of firm quantity markers, especially as it related to the number of publications and the amount of grant dollars the participants were expected to produce. For example, when I asked Destiny if she had a sense of the number of publications and grant dollars she was expected to generate, she responded, "No." While Destiny learned that publishing in two particular journals is what 'counted' for tenure in her case, she had no sense as to the quantity of publications expected of her, nor insight into the performance expectations within teaching and service.

For other participants, firm quantity markers as well as performance expectations within teaching, research, and service were also lacking. Beyonce stated:

No one will ever give you numbers. So there's no, you know, 'you must have X number

> of papers, you must have X number of dollars'. I think the expectations were that I would bring in research money. The expectations were that I would publish papers. You know, that there was a teaching load… That's really about it. (Beyonce)

It was clear that Beyonce had few indicators that clarified what was required or expected of her in terms of teaching and research-related activities. Not only did Beyonce lack firm quantity markers with respect to publications and external grant amounts, when I pressed her about her service expectations, she responded:

> …when you say expected, I don't know. No one ever laid out, 'this is what we expect you to do'. I don't even think there were unconscious expectations other than the fact that, you know, you're supposed to be involved with students. (Beyonce)

For Beyonce, the weighted value and quantity of performance activities remained elusive for the most part. For Destiny, she understood that publishing and publishing in specific journals carried the greatest weight, but it was not clear how many publications were expected of her to make tenure or what criteria made up the standards for mediocre in her teaching performance. For Maria, it was the range of publication quantities and the participation in certain service committees that guided her efforts to tenure, although many times she received conflicting information and expectations remained undefined. For others, such as Flora, who made tenure at an RU/H, a different set of guiding markers helped her although the details were not explicit. She stated, "40% teaching, 40% research and 20% service" (Flora) were guiding percentages that guided her efforts to tenure.

Not all participants faced the challenges of vague promotion and tenure requirements in the same way. Some expectations were clearer for some than for others. What is certain is that conflicting information, undefined expectations, unwritten rules regarding the value of

performance activities, and a lack of firm quantity markers, especially for publication and grant dollars, permeated the pre-tenure years for a majority of participants and contributed to vague promotion and tenure expectations.

Grant and Publishing Pressure

For the majority of participants, research was among the most valued performance area to make tenure. As a result, securing external grants and producing research publications were two activities that made up the source of much pressure for all participants. Even those participants who were at institutions where teaching and research were equally valued were faced with continual pressure to secure significant levels of external grants and to produce research publications as a main currency for tenure.

It should be noted that the pressure to secure external grants is especially heavy for faculty in STEM contexts. That is, the pressure to secure grant dollars is not just about getting grants for the sake of making promotion and tenure only. There is a high start-up cost associated with conducting STEM research and with maintaining a productive laboratory. Initially, departments invest substantially in the early careers of STEM faculty as part of a start-up package offer. In turn, STEM faculty members have pressure to get grants not only for reasons associated with the initial investment made into their success, but also in order to maintain and advance their research agendas and laboratory needs.

Securing grants and publishing research articles are two distinct yet related endeavors. There were three dimensions that contributed to the participants' feelings of pressure as it related to securing grants and publishing: (1) difficulties related to both grant *and* publishing pressures (e.g., a lack of quantity markers, disruption or imbalance to the semi-dependent aspects of securing grant and publication outputs, and writing), (2) *grant-specific* barriers (e.g., reduced

prestige/value of one's research by colleagues if there is continued difficulty in securing grants, increased competition for grants, difficulty navigating funding agencies) and (3) *publication-specific* obstacles (e.g., particular publication output is accorded certain value/esteem).

Regarding grant *and* publishing pressures, one key problem voiced across the participants was a lack of existing quantity markers. What was clear to the participants, however, was the need to establish a solid publication record since that was a main evaluation marker for tenure. If it was not the most important criteria, it was clear to the participants that it was important in combination with another criterion in their setting.

For many, knowing the weighted value of securing grants/producing publications in combination with a lack of quantity markers resulted in an "as much as you can" mentality. This arrangement led to anxiety and stress. The sentiment expressed by Olivia rang true for many: "I just need to bring in *as many* research dollars as I possibly can, and I have to publish as much as I can." That is, many participants expressed their tireless efforts to secure as much funding as possible and to publish as much as possible throughout their junior years.

Obtaining grants, sustaining research activities, and publishing were distinct pursuits. Yet, a link between funding, research activities, and publications often existed. Thus, another issue that contributed to grant *and* publishing pressure was the disruption or imbalance of these semi-dependent pieces that contributed to the participants' feelings of pressure. Securing and maintaining a substantial amount of external funding enabled research activities to take place and to continue. That, in turn, created a platform where the publishing of results was made possible. When there was difficulty in acquiring grants, a domino effect often ensued.

For instance, Jasmine explained that despite her efforts, in her first three years she had written seven or eight grant proposals but they had all gotten rejected. She recalled that her

departmental annual evaluation feedback was riddled with the message of "do more, do more, do more" (Jasmine). She explained that her department expected her to have an increasingly greater number of publications as each year went by. However, whereas she should have had four by a certain point, she only had one publication. Jasmine highlighted the chain of interlinking events:

> Well, if you don't have any money, you can't fund your work. And if you don't have any money to fund your work, then how are you writing articles? Right? So it's all a very, it is very complex, it's very dynamic. (Jasmine)

Disruption or imbalance of these semi-dependent pieces was more extreme for some participants than for others. For example, Engineering described this interplay as "the toughest thing that [she] faced going for tenure." In her case she learned just how intricately linked research activities were to funding, and to her ability to publish.

Engineering did not have enough funding to sustain her laboratory. As a result, she engaged in an intensive period of grant proposal writing and submissions but after a steady stream of grant reviewer feedback, she quickly learned that she was not pursuing "an area suitable for funding" (Engineering). Therefore it was not possible to sustain her lab, thus her research activities, and consequently her ability to publish. After much exertion over three solid years, Engineering settled in a related, but fundable, research area that she enjoyed. Engineering's greatest lesson from her early career concerned the relationship between obtaining grants, sustaining research activities, and publishing. In reference to her making tenure, Engineering emphasized just how important this lesson was. Engineering said, "So finding a research area that is publishable and that will provide you opportunities for funding was the most critical thing." Further, for Ava and Beyonce, not only was the pressure to publish and to secure

funding continually present, it was the act of writing itself that posed the greatest challenge for them.

Grant-specific challenges were also present. Three concerns arose. The first was related to a disciplinary norm that one's ability to secure external funding suggested the viability of one's work. One participant said, "To be honest, the bottom line here is can you get funding for your research?" (Sweet). A second participant explained, "Because in our profession, you know, funding, money to support your research, is a thing that brings you clout. Or at least establishes your work as being relevant and viable" (Jasmine). Jasmine indirectly suggested that a lack of funding shows otherwise.

The second grant-specific concern was the difficulty in getting oriented with funding agencies. For example, Isabel stated that one of her greatest difficulties in terms of research activities was "to learn how to navigate the vast funding agency world." The third grant-specific issue was the sheer difficulty in securing grants. At least one participant asserted that the extremely competitive nature of securing grants was a result of today's tight fiscal era. Maria stated, "in this day and age of competitive grants through [funding agencies], you really have to do just about anything to get your grant funded…" Although grant funding levels were often linked to research productivity, not all participants struggled in the same way. Some participants found securing grants more difficult than publishing, and others found publishing more difficult to produce than securing grants.

For instance, for participant Ann, it was more the publication side of things that presented an obstacle. Ann stated, "I'd been, I'm good at raising money. Still good at raising money. But I hadn't turned them into papers." In her own words, Ann revealed that she "barely" made tenure. Since Ann had demonstrated evidence of an exceptional teaching record and a

fulfillment of her student responsibilities, I wondered if her 'barely' status was due to her research activities. I asked: "So, was it all hinged upon your publications, despite everything else?" She responded, "Yes. Yes. Yes. Yes" (Ann). Ann further elaborated, "I was on the edge of not getting promoted because I didn't have enough out there," referring to the number of articles she had managed to publish.

Ann's elaborated response touches on the publication-specific challenge reported by the participants. Not only was there pressure to publish 'as much as' one could, it often mattered *where* individuals published. Destiny affirmed that it was more than just securing grants, but also publishing as much as she could that mattered. She recounted her own story of success as it related to her publication record:

> You've won the outstanding teaching award, that's really great and that probably played some into getting tenure. But it was the fact that I had to get out pubs and what you do is you just write. You get out whatever little something that you've been doing, you write it up and get it out whether it has a stream of consciousness or not in terms of theme is not as important as how many pubs you get out. (Destiny)

Another participant, Sweet, also reported intense pressure to publish. Although Sweet was able to publish her work (and to secure grants), due to her research niche, her publication record appeared less esteemed than her colleagues' in terms of where she was able to publish and how frequently. The change in tone halfway through her response suggested a slight struggle. She said:

> I've been lucky. I mean, I've had three, I think this is my fourth National Science Foundation grant so I've always had money from a prestigious place so no one really bothers me about what I do. But I know in terms of publishing, it is harder to publish that

kind of work. So in terms of the number of pubs and where I pub, my vita looks less prestigious, if you will, than some of my peers. (Sweet)

To be clear, all participants dealt with constant *pressure* to secure substantial grant dollars and to publish as many articles as possible. Not everyone, however, necessarily struggled to secure external funding and/or to publish, nor did they struggle in the same way. There was one participant who did not express an obvious grappling with funding or with publishing. Despite the different ways that each participant struggled with the two issues of securing grants and publishing research articles, it was clear that all participants experienced pressure to produce and to perform in these two areas to fulfill this main currency for tenure.

Work-Life Difficulties

In addition to vague promotion and tenure expectations and the pressure to secure grants and to publish, 11 out of the 13 participants cited work-life difficulties as the third challenge area. There was a spectrum of issues, from the strain of having to maintain long distance relationships to the pressure of cultural demands that resulted in a number of obstacles. Specifically, three sub-themes emerged: (a) an impact of work on personal relationships, (b) Hispanic/Latina cultural work-life tensions, and (c) Hispanic/Latina mothers on the tenure-track. The first sub-theme, an impact on personal relationships, was relevant to the 11 participants who reported work-life difficulties. The second and third sub-themes were relevant only to the Hispanic/Latina participants who reported difficulty in managing work-life issues. I now turn to the first sub-theme, impact on relationships.

Impact on relationships. Most of the participants reported experiencing strain in their personal relationships as a direct or indirect result of pursuing a tenure-track position. There were three main issues that led to this strain. Geographic distance was one issue. A second issue

was limited available opportunities to partners/spouses, and the third was difficulty to be fully present in one's personal relationship due to long and demanding work hours.

As previously noted, 11 out of the 13 participants faced work-life difficulties. Of these 11 participants, nine reported having undergone divorce, separation, or strain in their personal relationships as a direct or partial result of accepting their tenure-track faculty positions. Many participants echoed Isabel's response when I inquired if they had ever encountered work-life balance challenges amidst their early career. "Constantly, constantly" replied Isabel. Geographic distance was one cause that led to relationship strain.

Isabel explained that she had initially limited herself geographically and accepted a non-tenure track position so as to not disrupt her family life. In need of finding another post, she recounted a conversation with her husband. Isabel said to him, "I had been limiting myself geographically because of our relationship." She continued, "would you be willing to consider my looking for another job somewhere else and then maybe, you know, you would be willing to switch to another job?" (Isabel). They agreed on this plan and Isabel explained that she "went on an all-out search" (Isabel). "Over a period of a year, I had lots and lots of interviews and discussions of potential offers," said Isabel.

She continued to explain the change in events. "Now, once I decided to accept the job, to make a long story short basically, my husband and I separated. I mean, not right away. We tried to maintain our relationship across the distance, but..." (Isabel). After her trailing off, Isabel continued her emotional response as she explained the work-life tension:

> …for me, it was not a matter of choice. I mean, I was already here. I loved my job. My children were already here and, you know, I mean, I have never regretted making the move from the professional side. But it did cost me my marriage. Yeah, no, it was, you know, I will definitely say that it was a very, very difficult five to seven years. Very

difficult.

Isabel and others acknowledged that their geographic move played a role in what ultimately transpired in their personal relationships, although it may not have been the only contributor to the divorce or separation.

A second cause that led to strain in personal relationships was the limited professional opportunities available to partners as a result of accepting a tenure-track position. For example, Maria made clear the link between her faculty position and this particular struggle. She said, "Since I accepted the position here, it kind of limited his opportunities and that's been a constant source of, of bad feelings, I guess, between us." Maria explained that as a result of her accepting a tenure-track position which she described as providing "the best of all worlds for many different reasons" (Maria), she and her husband have "constantly struggled" (Maria) to find career options for him. She noted that there were expectations on his side that also contributed to this tension; however, Maria did not elaborate on what those expectations were.

A third issue that impacted personal relationships was the sheer demand of disproportionate work hours to home life. It was difficult for many participants to spend the necessary time at work to produce what was needed to make tenure and also be fully present in a personal relationship. For example, Avignon shared her story:

> …I had a partner and that all fell, fell through because as I started to, just to make the effort that was clearly going to be required if I was gonna make tenure, I could not be the person that he knew and expected me to be. So I'm very, I take care of the people around me. That is my nature and that was what he found attractive in me. But I couldn't be there for him, you know, as much as he wanted and I actually needed support from him and so, you know, once that model changed, that wasn't gonna work.

To deepen the matter, Avignon continued, "…the other piece was children. I had a condition that meant that if I was gonna have a child, I needed to do it within the next year." This participant depicted the difficult decision she had to make and the emotional agony she endured as a result of pursuing tenure. Avignon said:

> So all of that was happening at the same time and I was just paralyzed with, with fear. I had this constant, every day I was thinking 'you have to make a decision. You either have to commit to this path of being a faculty member and just forget about this guy and children, you know. Fully commit and then just see what happens. See if, you know, you still have time to meet the one, have a child', *or,* the other path was what, you know, my partner was advocating—quit. Quit the position, leave. This is not for you. It's changing who and what you are. And more importantly, you know, our relationship is suffering.

In her own words Avignon concluded, "So the relationship broke up. I forgot about having kids. And I just diverted all my energies and efforts to getting as many papers out as possible in the short time that I had left." Working long hours, geographic distance, and limited professional opportunities for partners were reasons that many couples "drifted apart" (Sweet), or that contributed to relationship strain. It should be noted that two participants did not report strain in their personal relationships as a result of pursuing a career in the professoriate.

Hispanic/Latinas, cultural work-life tensions. The findings indicate that cultural work-life tensions was a sub-theme disproportionate to participants who identified as Hispanic/Latina. Of the eleven participants who cited work-life difficulties as a challenge, five were Black and six were Hispanic/Latina. One Black participant cited cultural work-life tensions. A second Black participant cited traditional gender roles at home. By comparison, however, all but one

Hispanic/Latina talked about one or more cultural related work-life tension. For the Hispanic/Latina participants, three discrete but interconnected cultural nuances contributed to cultural work-life tensions. They were: pressure/expectation to have children, family first, and traditional domestic gender roles.

While generic statements about Hispanic/Latinas should be treated with caution, in this study nearly all Hispanic/Latinas identified with one or more of these cultural nuances. That is, participants felt pressure to have children, an expectation to be the primary domestic and family caregiver, and/or experienced a degree of work-life tension due to embracing the cultural value of family first. Some participants experienced a high degree of all three, other participants experienced a low degree of only one of these cultural nuances. These existing cultural norms were reinforced through messages received from a number of directions, including Hispanic/Latino community of friends, extended family, parents or immediate family, and traditional Hispanic/Latino husbands. One participant talked in depth about how the pressure/expectation to have children was interconnected with traditional domestic gender roles.

Engineering explained that many male Hispanic partners, like hers, "…want you to be at home." I inquired about how much pressure she received about this. She replied, "…a lot of pressure, *a lot* of pressure. A lot, like constantly. And that's a big challenge" (Engineering). Engineering shared that she constantly resisted receiving pressure to leave the tenure-track to instead fulfill an otherwise traditional cultural role. Referring to her partner, she stated:

> He'd been asking me to leave my job, to focus on having a family. And I said, 'I don't think I want to leave, specifically at this point'… So I'd been telling him, 'I'm not going to leave my job', specifically at this time. (Engineering)

The distress was heard in her voice regarding the constant internal struggle she lived with regarding the decision to adhere to her personal cultural norms, versus her professional work life. She anguished, "…I would die at home. I would die at home. I don't know, I would die if I stayed at home." At the same time, mid-thought she succumbed: "I just don't know…maybe" (Engineering). She rationalized about her cultural norms, "…like Hispanic ladies they, a lot of Hispanic ladies, they stay at home. They are housewives" (Engineering). Engineering continued to explain the pressure placed on her even today, "He's been telling me, 'You're young. You can do other things at home. You can still work at home'." Flip-flopping yet again, Engineering continued, "I mean that's right, I can do a lot through email or the internet or…" but then returned to her original conviction:

> I said, 'I don't want to do that'. It's hard. It's been hard because although he is a professor and he knows the meaning of being a professor, he's *still* giving me pressure to leave my job to stay at home.

She further illustrated that such pressures came/continue to come from sources beyond a traditional Hispanic/Latino partner. Engineering stated:

> So, it's not only him. Like my family, they've been asking. They don't ask anymore, they ask too much, 'when will you get married'? 'When are you going to dedicate your time to have a family'? And so I receive constant pressure. A lot of pressure.

Engineering remarked that ultimately she had not learned how to deal with this cultural work-life tension. She explained that she did her best to juggle both worlds by separating the two, but to little avail. Engineering said, so "when I go home, I dedicate my life to him. He doesn't complain, but yet still he's complaining". She concluded, "One more pressure to deal with" (Engineering).

Engineering exemplified one extreme of how the expectations to have children and to fulfill traditional domestic gender roles can lead to cultural work-life tensions with which some Hispanic/Latinas must contend. For other participants, the pressure wasn't quite as acute, but the cultural awareness was present. For instance, Maria stated that she and her husband do not have children. In reference to that she said, "I think it's kinda funny, I suppose, just because it's very anti, anti-culture, in my culture" (Maria). She did not appear to dwell too much over inquiries by extended family members: "You know, my aunts come up to me and say like, 'why don't you have a baby'?" (Maria). Maria concluded, "You know, they don't understand who I am" (Maria).

Apart from the expectation to have children and to fulfill traditional domestic gender roles, another participant talked about a third issue: the existing tension between her career and her value of family first. Ann explained that in academia it is often the case that to be successful you must largely embrace a single focus on work. Ann expressed how that value conflicted with her cultural value of family first. In reference to a conversation with a colleague who was sharing the details of his book tour schedule with her, Ann stated:

> So I see that some of the things that help people promote themselves and get on other people's radars, I'm just, I still can't do. I still won't. I still won't do. Cuz I won't leave my family for that long. Even if they would agree to it. I can't do it.

Ann acknowledged a cultural work-life tension when she said, "So I think that, I'm just sort of constrained by just my reality of who I am." She articulated that while she may be an academic engineer, she is also Latina and cannot be so single-minded on work. She said, "And I hate to say it cuz some of the most successful people, you just go out there and you don't care about anyone else and you just run your agenda and push it" (Ann). In reference to herself she

said, "…it's just not who you are. To be that, you know, single-focused about just you and your getting ahead. So yeah, there's a balance of playing the game…" (Ann).

The citing of these cultural elements did not translate into a common lived experience. For instance, while all Hispanic/Latina participants valued that family came first, it constrained some while not impeding others. Further, although not detailed above, it should be noted that two participants, Engineering and Flora, talked about additional cultural nuances that impacted their career initially. They were language, acculturation to U.S. culture, and a cultural norm to not question authority. These obstacles did not affect all Hispanic/Latina participants. For instance, language and acculturation to U.S. culture were not a factor for domestic-born Hispanic/Latinas, nor were these factors a shared experience by all non-domestic born participants. These additional cultural nuances were nonetheless important and worth mentioning.

In sum, nearly all of the Hispanic/Latina participants who talked about work-life difficulties cited at least one of three cultural expectations that contributed to cultural work-life tensions: pressure/expectation to have children, traditional domestic gender roles, and family first. As previously noted, the intensity and number of cultural work-life tensions felt by any one of these participants differed based on their individual backgrounds.

Motherhood and the tenure-track. Six out of the 13 participants were mothers. Three of the six mothers were Black women, and three were Hispanic/Latinas. Three Hispanic/Latina participants expressed work-life tensions related to motherhood, while three Black participants expressed minimal or zero tension regarding motherhood amidst the tenure-track (see discussion, chapter five). Thus, my findings indicate that this sub-theme was disproportionate to participants who were Hispanic/Latina mothers on the tenure-track.

Hispanic/Latina mothers who were on the tenure-track faced unique obstacles due to the cultural dimension of primary care giving and domestic responsibilities. For instance, they experienced further pressure to perform with excellence in both their personal and professional spheres. Additionally this cultural dimension exacerbated the stress for the participants, particularly after childbirth if inadequate maternity leave policies were in place. Third, this cultural dimension resulted in preventing some from feeling as though they could embrace motherhood.

Keeping the recently-presented Hispanic/Latina cultural nuances in mind, those participants who did have children indeed took primary care giving and domestic responsibilities at home. This added further strain, as it was hardly a negotiable for this sub-set of participants. Put simply, Flora stated: "In my culture, this is what you do" (Flora). Another participant, Isabel, explained:

> …because there is the cultural expectation that you're gonna be this wonderful mom. You know, who meets her children at their school bus stop and feeds them cookies and makes them these wonderful dinners. The reality was actually quite different.

The expectation to perform with excellence in both spheres, academic STEM and within a traditional gender role, took its toll on these Hispanic/Latina mothers. Isabel expressed:

> …there were periods of time after my second daughter was born that I really felt that 'oh, my gosh, how am I ever gonna balance all of this stuff?' and you know, time with my husband, time with children, you know, and then the demands of the job.

Ann shared why she needed to rush home at the end of the day; she stated, "cuz I've gotta go home with the kids and get dinner on." The reality of not being able to spend as much time with

their children or the pressure to have to put work over family in order to maintain productivity levels resulted in feelings of "guilt" (Isabel) or "selfishness" (Ann).

To compound matters, when proper maternity leave policies were not in place, further undue hardship ensued. This affected at least two of the three Hispanic/Latina participants in particular. In both cases maternity leave policies were described as informal, and in both cases the department chair refused to allow these faculty members proper time off. It didn't matter that Ann and Flora had arranged with colleagues to cover their courses for the semester.

Flora recalled her department chair's response to the colleagues who had offered to cover her class. Flora recounted what the chair told her colleagues: "no, absolutely not. She needs to come back, be here October 1st." Flora recounted that she insisted to her chair, "Well, at least I'm entitled to some weeks off before, so, what's gonna happen?" He replied, "Well, I don't know what you're going to do but you need to come to work October 1st" (Flora). She concluded, "I had my child and I went back to work on October 1st." It was a strenuous time for Flora as she recalled her situation:

> So I would teach my class and then walk across the campus to go feed, because I was breastfeeding my child. He was just two months, I would go breastfeed and then come back to teach and then go back there, so did that... several times during the day.

Ann described her maternity leave period this way, "It was pretty terrible." She continued, "I was there four weeks after my son was born, with my son in a sling, teaching classes. So you know, it really was a very not good experience at the time." The participants explained that after childbirth, there is a transitional period where things tend to slow down. Flora clarified, "not just because of the need to care for my baby, but naturally what your body goes through in a pregnancy. Your focus after childbirth is not, is not totally there."

Though not allowed proper time off, Flora and Ann were expected to keep working at the same rate—teaching the same level of courses, continuing to serve on committees, and publishing. Although all of these Hispanic/Latina participants ultimately persevered, they were pushed ever more by the need to persist at the intersection of cultural life, motherhood, and STEM tenure-track demands. Due to these compounding pressures, a reality of being spread too thin during this delicate life transition ensued.

Additionally, motherhood and the tenure-track was not always about being a mother, it was also about participants feeling or deciding that they could *not* enter into motherhood *because* they were on the tenure-track. For at least one additional Hispanic/Latina participant, Engineering, a sense of not being able to do both (become a mother and pursue tenure) impeded her decision to form a family.

In reference to having children of her own, Engineering said, "I think risking, not risking but, I don't have a personal life in the sense that I don't have family." She elaborated her rationale, "It's been very hard to have a family. If you become a professor, you are busy working on your research, working with students…you rarely have time to be with your family. So I don't have a family…" (Engineering). Despite cultural expectations of having children and taking on primary care giving roles, not all Hispanic/Latina participants desired to have children. Further, recall that at least one Black female participant, Avignon, also felt that she needed to 'forget about' having children in order to successfully make tenure.

Thus far, three challenges have been presented: vague promotion and tenure expectations, pressure to obtain grants and to publish, and work-life difficulties. As highlighted in this section, work-life difficulties impacted the personal relationships of 11 out of 13 participants. Cultural work-life tensions for Hispanic/Latinas, especially those who were mothers on the tenure-track,

emerged from the data. Next is a fourth overarching challenge reported by participants: navigating a gendered and racialized academic landscape.

Navigating a Gendered and Racialized Academic Landscape

All study participants were confronted with overt or covert gendered and/or racialized experiences. Three main sub-themes emerged regarding the navigation of the academic landscape: (1) the development of race and gender salience at predominately White research universities; (2) subtle or background stress related to racial and/or gendered incidences; and (3) personal ethnic/cultural discord with predominately White/patriarchal institutional culture. The majority of participants reported White male faculty members or White male students as the primary performers of the acts that led to these emerged themes. Campus events, departmental settings, and classroom environments were three main areas where such events occurred or were encountered.

Development of race/gender salience at a PWI. The first sub-theme consisted of those whose race and gender became salient only after being placed in a predominately White research university setting. For example, Sweet explained:

> But moving here, I can say I never really felt a strong racial identity. I think that's part of it, too. Like, I always knew I was Black for sure, but I think just growing up in [state] and then being in [city], it was, there were just so many other Black people that I never felt like it was any hindrance to me.

Sweet continued to explain the onset of events that occurred during her attendance at a non-disciplinary related campus-wide event. She said:

> But when I came here, and just, there just weren't many people like me, one huge trigger was when I was first here and I went to some event…and I remember being there and this

> White woman was talking to me and I was like, 'yeah, I'm a professor in [area] technology', and she's like 'Oh. You're a grad student? You're studying?' I'm like, 'No, I'm an assistant professor'. And she wouldn't accept that I was an assistant professor. (Sweet)

Then a "Black man dean" (Sweet) who she met at this same event also dismissed her status as a STEM faculty member, despite her clarifying her title. Sweet said, "…he kept referring to me as a doctoral student." I asked her how this made her feel. She described her internal response:

> And I'm 35 years old, you know. I'm a grown woman at the time. I'm like, 'why do they keep wanting me to be a doctoral student?...I have a Ph.D. behind my name. I'm a professor. And it was like people couldn't even resonate that this Black woman is a professor. And *that's* when it just really started hitting me. (Sweet)

Although the majority of participants reported being at the receiving end of a gendered and/or racialized occurrence primarily brought about by White males, Sweet found herself at the center of a gendered and microaggresive experience initiated by a White female and a Black male. For Sweet, this experience led to or contributed to newfound feelings of isolation, withdrawal, and emotional distress as she persisted on the path to tenure. As the only person of color in her department, Sweet also explained that working in this particular context heightened the negative impact associated with her token status because she was reminded of it on a daily basis.

Participants reported gendered racism in contexts that were outside of their specific STEM disciplines, such as Sweet did. Others reported that the onset of such experiences took place within their departmental homes, such as what happened to Flora. Flora's first recount of gendered racism occurred in her departmental setting soon after she was hired. A White male

professor said to her, "…you sure did play that Hispanic woman card" (Flora). Flora replied, "What do you mean by Hispanic woman card?" He replied, "Well, yeah, you got your position" (Flora). Flora explained that he continued with his final comment, "Well, you're the good kind of Hispanic because you don't look it." I asked Flora how these remarks made her feel. She responded, "Oh, that was terrible." She continued:

> What was it? Because I was not familiar with that at all…So it wasn't until I became a professor at [university] and I heard those two comments from this man that made me say, 'wait a minute'…and I was kinda like, my eyes were opened. (Flora)

Over her time as an early career faculty, Flora reported that she also came to realize the extent of negative gendered and racial stereotypes regarding the mathematical abilities associated with women and Hispanics.

Isabel is yet another participant who reported that the salience of gender, as it was in her case, occurred only once she began her career in a predominately White institutional setting. Unlike Flora and Sweet, however, the inception of her experience took place in a disciplinary-related context—a technical engineering presentation at her institution. It was in this setting that a White male visiting professor commented to her that "…female scientists in the UK were like second class citizens" (Isabel). Isabel replied to him, "I don't think that's true here." Isabel recalled his reply: "Oh well, eventually you will know." She described that after he finished his presentation she raised her hand to ask a question but "…he ignored me. He did. He absolutely did," said Isabel. She described what happened, "I raised my hand. I stood up, I went this way, to the right, to the left, and he made his point" (Isabel).

She continued, "it didn't take but for him to finish his presentation to make it abundantly clear to me that…I was living on another planet" (Isabel). Like Sweet and Flora, Isabel

concluded with a similar message, "And it took that particular event for me to become a lot more sensitized about this issue. Because up until that point, you know, I honest to goodness had never, I internalized everything…" However, Isabel added, "Now, it doesn't mean that I did not feel out of place" (Isabel). She was referring to the fact that she was "definitely the only one" (Isabel) with regard to being a woman of color in her department and in many engineering settings throughout her education and professional career.

Background stress, racial/gendered incidences. Under the main theme of 'navigating a gendered and racialized academic landscape', a second sub-theme was that of experiencing subtle or background stress related to racial and/or gendered incidences. In some cases, such as for Olivia, it was not possible to determine the demographic profile of students involved in her situation. Olivia shared that her student evaluations for engineering courses were either excellent or were riddled with gendered remarks, such as "her lipstick is too red" (Olivia). She asserted, "They would not say some of the things that have been said in my student evaluations if I was a White male. I am certain of that" (Olivia). Olivia continued with a slight tone of irritation, "What does that have to do with …the teaching evaluation, right? Her lipstick is too red. So what? What way is that in any way relevant? It's just, anyway…*those* kinds of things."

The wave of tones used in Olivia's words as she responded to me with a mix of slight irritation, followed by a calmer "anyway," followed again by a firm and confident closing of "*those* kinds of things" suggested that even though she may have been able to brush off this repeated occurrence, a residual of background stress or annoyance was present.

Another participant, who was the first Black faculty and first woman of color hired in her college, stated that although she described her colleagues as "very warm and receptive" (Jasmine) she also came across subtle forms of visibility and distinctiveness in her work-place

setting. Jasmine stated, “It’s funny because I can think of a couple times when one of the older White guys down the hall [said], ‘you know, there’s this Black guy who works on the third floor. I’ll have to introduce you to him if you’d like’.” She expressed a low level of uneasiness when she said, “And so, interesting that he would make that comment in that way. Right? You know, like somehow all Black people have to know each other” (Jasmine).

She recalled another incident. Jasmine said, “It was always funny, that all the minority mail would end up in my office…And I always thought that was just hilarious that, you know, it would be absolutely nothing that I should see or do, right? But it always, it always found its way to my office” (Jasmine). While Jasmine was able to make light of her tokenized experiences to a certain extent, she also said about it, “Some days I just kinda felt like it really showed their ignorance” (Jasmine), in reference to her majority departmental colleagues. While her tokenized and racialized experiences did not impede her in any way, she nevertheless paused to express at least a subtle level of displeasure about it. She concluded, “But it wasn’t like I got annoyed or anything….I never felt like bothered by it or anything” (Jasmine). Other participants, like Ava and Maria, also talked about being exposed to gendered and/or racialized episodes in their work-place setting. Despite their ability to “walk right through it” (Ava), such incidences were acknowledged by Ava and Maria and nevertheless caused pause in their reflection about these experiences in their early career.

Cultural discord. The third sub-theme that emerged within the ‘navigating a gendered and racialized academic landscape’ was the participants’ personal ethnic/cultural discord with predominately White/patriarchal institutional culture. In some cases, such as for Ann, it was an issue of bicultural stress. Recall the cultural work-life tensions reported by some of the Hispanic/Latina participants in the previous section. Ann, for instance, struggled deeply and

constantly with embracing a single focus on work in order to succeed because it conflicted with her personal cultural values of placing family first.

Further, Ann also mentioned feeling selfish turning away students in exchange to get ahead. She said, "So I feel selfish if someone comes and they say, 'I really need your help', particularly students, and I have to say I don't have time for you" (Ann) in order to put her agenda first. "I can't do that," Ann explained. I asked her if there were any other issues that she struggled with based on her cultural viewpoint. She recalled a piece of advice given to her by her former chair, a White female: "You just gotta play the game. You gotta do whatever you need to do to get promoted" (Ann). Ann expressed her frustration and identified why this caused an internal conflict for her with mainstream institutional values:

> I still just can't believe that people can be just saying look at the whole thing as a game and they're just gonna…kinda weigh out the rules and that's what they're doing…It's just a game. I still have trouble resolving myself with that. The fastest way forward is just to play the game and just completely recognize it as a game. To me, it's just (sigh) it's hard. Because it's not just a game, it's about people and the students, they move forward and they make lives for themselves.

Avignon also exhibited signs of bicultural stress. She described her internal struggle regarding her ethnic/cultural values of success compared to what was expected to succeed in her culturally dominant work-environment. She said:

> …in my family, the model of success is you have a family, you have a good career, you make good money, you own your house, you own your land. Okay. And you have good friends. And so my siblings, they all have that model of success, but I don't. I don't. I'm single. I live a fairly isolated life in a very different culture to what I'm used to. I

> don't have children. I don't have a partner. And work disproportionately takes up my life. So based on my cultural values, I'm not a success. (Avignon)

She pinpointed the conflict as illustrated below:

> And that is not the model you should follow if you want to do well in my business. To do well, you really need to be single minded, 100%, not just in your professional life but almost in your personal life. And that is something that I completely struggle with. (Avignon)

Other participants, such as Beyonce and Destiny, struggled more so with the patriarchal aspect of their institutional or disciplinary work-environments. Beyonce said, "I had more of a problem being female than I had being Black" (Beyonce). She reported a heavy skew of White faculty members in her institutional setting, and White males in particular within her engineering departmental and classroom environments. Beyonce cited White male students as the main perpetrators who repeatedly took advantage of her in the classroom during her first two years of teaching. In a vivid recollection, Beyonce gave an account about a White male student in her classroom:

> …he actually stood up in the back of the class and basically started screaming at me that he didn't have to listen to a damn thing that I knew, that I was saying, because he *knew* that I didn't know what I was talking about.

She also recalled an incident that involved an African-American male student who took her engineering course. She explained:

> I actually had a kid offer to wash my car in order to pass a class. And I actually looked at him and I said, 'I can't even believe, I can't even understand what would possess you to make that kind of a statement to me'. (Beyonce)

She asserted, "…and I'm sure he would *never* have done that with a White male faculty member" (Beyonce). According to Beyonce, she belonged to a small department where communication was frequent among faculty and she knew of no such incidences where male students had approached or treated her male faculty colleagues in the ways that she had been by these same departmental male students. Another participant, Destiny, also reported discord with the "patronizing" culture of her work-environment. Destiny asserted that she continually had to "fight for [her] credibility."

My findings show that there was a mix of settings and ways that these events occurred: within their disciplinary contexts, at times within their departments but seemingly unrelated to the discipline itself, or at general campus events that were unrelated to their immediate fields. Further, some participants cited a strong level of conflict and difficulty with having to subscribe to culturally dominant values, norms, and expectations in order to succeed; others less so. As a result, while all of the participants were exposed to some level of gendered and/or racialized incidences within classroom, departmental, or institutional settings, these barriers were viewed and interpreted in more than one way.

For example, some participants recognized that the STEM culture itself was riddled with gendered and racialized challenges for them as women of color. Other participants disagreed and attributed such experiences to be a result of their work-place space being entwined with a broader historical institutional environment where dominant and male cultural norms, values, and expectations prevailed. All participants, however, vehemently questioned whether they would have been at the center of their work-place racialized and/or gendered incidences in the manner they had experienced had they been a member of this privileged group.

Despite what the participants reported, however, many of them held strong identities as academic scientists and engineers. Many participants, even those who reported cultural or disciplinary-based conflicts, perceived that the subject of their research topics pursued, and the scientific methods and methodologies used that govern their disciplinary cultures, were apart from the personal gendered or racialized related situations that they had experienced. In other words, the participants did *not* report "push back" regarding issues of methodology, use of particular theories, or research topics that they studied as an area of concern constituting a barrier or obstacle in their context as STEM professors. For example, referring to her use of particular theories and scientific methods, Avignon explained, "I mean, it's not related to me or my ethnicity or my cultural values." The *absence* of these challenges for early career Black women and Hispanic/Latina STEM faculty *is* often reported for women of color faculty in the social sciences (e.g., use of critical race theory, race-based research topics are often met with resistance). This finding suggests a distinction between women of color who are in STEM contexts versus those who are in social science contexts.

In addition to the challenges described above under the theme cultural discord, thus far I have highlighted a total of three other challenges: (1) vague promotion and tenure expectations (2) pressure to obtain grants/publish and (3) work-life difficulties. The fifth and final challenge uncovered in this study was service.

Service

Within the area of service two primary sub-themes emerged. First, eight out of 13 participants reported an inordinate level of constant service requests. Second, the same number of participants described struggling with an internal sense of obligation toward service, particularly as it related to students, thus finding it hard to say no.

Disproportionate service requests. With respect to service requests, for example, one participant had received and entertained so many service requests that her mid-year evaluation promotion and tenure committee "wrote back and asked for verification for those" (Ava) activities based on her submitted packet—which she was able to do. The participants also described the type of service requests they typically received. Ava stated:

> …what happens in a situation like that, when there still were very few African-American females on that side of the house, on that STEM side of the house, you get asked by graduate groups to talk to graduate women, all the way down to doing stuff for [discipline] sciences at the state fair and talking about your research at the extension services.

Another participant explained a distinction between the type of diversity service requested of them. Sweet clarified, "I shouldn't say the service is diversity-related but a lot of the service is trying to have a diverse composition of people to hire new faculty." She added, "But I have been on diversity committees as well. It's been both….I've been sought out after to bring diversity *to* committees…more so than just being *on* the diversity committee" (Sweet).

Further, Avignon depicted three sources and levels from where she received service requests "…within our department…at the university level…then at the national level." Like many of the participants, Avignon also affirmed her awareness of being disproportionately sought out for certain types of service requests compared to others when she said this about service, "I get more requests for certain types of work than my colleagues."

Service requests were also informal, primarily in the form of mentoring and student requests. Destiny said, "I took on students, particularly females, White females that nobody else wanted as graduate students. I'm thinking of two in particular, that people didn't want them, and

I took them into my lab and they earned their master's degrees." Destiny also served on a lot of women's committees. I asked Destiny if these informal service activities were by her own initiative, but she responded, "No. They sought me out. Both did," referring to individual women as well as women's committees.

Internal sense of obligation. The second sub-theme was the participants' feelings of obligation toward service. Many participants contended that they gave a lot to service because they had a hard time saying no, particularly to student-related requests. Why? Eight participants shared Ava's sentiments, "I also felt like it was an obligation." The participants of this study were magnets for students who needed mentoring. These faculty felt a level of commitment to help, even if their efforts were not formally awarded. Maria explained: "it's not the sort of thing you're gonna get recognized for…" with respect to her mentoring efforts making or breaking tenure.

This is how one participant explained why she had a sense of obligation to consider service requests, especially as they related to helping students. Avignon said, "…once you have [been] the person who made it through the system, you then had an obligation to help others. So I take that responsibility seriously." Yet, she also pinpointed the tension between service and what was awarded to get tenure. Avignon stated:

> *But* you know, it may be coming at the expense of my productivity. Ultimately, I'm going to be judged based on my grants and publications but I do, I think, too much mentoring, too much, I'm on too many committees… And it's difficult for me to say no because I do have that responsibility to help others, right?…I have to pay it back.

Like other participants, Avignon also felt that it was important to be a role model. The importance of being a role model also contributed to participants feeling an internal sense of

service obligation toward students. Several faculty resonated with Sweet's response about the importance of being a role model. Sweet said:

> So for Black students, it's just a matter of, 'I can see someone doing what I wanta do, but I think for the majority students as well, to have to interact with someone of color, someone that they wouldn't normally associate with [discipline] technology, I think that's helpful, too.

Further, participants felt a sense of commitment to give back to student communities as a result of being beneficiaries of campus programs that helped them advance their own educational and professional lives as former students of color. Maria was one example. She shared with me, "I've benefitted from these programs as an undergrad, as a graduate student, and so I feel like I am in the position now to make a significant impact on the current student population" (Maria).

Further, some participants also felt compelled to provide service activities to those ethnic/cultural disciplinary-based national associations, and their current student affiliates, due to having received support from those organizations as former STEM students of color. One example was provided by Beyonce when she said, "…the organization did a lot for me so it was something that I planned on continuing when I got a full time job." Another participant, Olivia, explained that she was heavily involved in co-creating a certain chapter within a national organization that supported Hispanic students as they moved into the professoriate in her disciplinary area. Olivia also felt compelled to continue to provide service activities to this organization and to the students within it. She expressed, "My service component is large compared to many faculty members. Large, much larger than most, in fact" (Olivia). Referring to her service activities as an early career faculty member as well as in reference to her service today, Olivia explained:

> It's okay. I like doing this. I'm going to do it. I'm going to help the Latino community in increasing, help as much as I can in increasing the number of Latino engineering professors in this country.

As previously noted, service was one of the many challenges that surfaced as an obstacle for the participants of this study. Up to this point, I have reported five main themes, and several sub-themes that emerged as a result of analyzing the challenges, difficulties, and conflicts met by these participants early in their careers. To review, the five main challenges are: (1) vague promotion and tenure requirements; (2) grants and publishing pressure; (3) work-life difficulties; (4) navigating a gendered and racialized academic landscape; and (5) service. Next, I present the strategies that enabled the participants to persist to tenure despite these numerous obstacles.

Section Two: Strategies

Making tenure is no small feat, and it was hardly an exception for the participants of this study. In addition to being met with a demanding work context and pressure to balance their personal lives, many participants also faced distinct barriers rooted primarily in their existence at the intersection of race, gender, science, and culture at predominately White, research universities. Yet, all participants persisted in their path to tenure and advanced their careers. Through their stories, I have learned about what contributed to the participants' abilities to navigate the promotion and tenure process successfully, how they were able to overcome challenges, and why they were able to persist amidst very challenges contexts. I provide an overview of my findings below, followed by an in-depth breakdown of each strategy.

An Overview: A Constellation of Personal and External Factors

An amalgamation of seven personal and external factors that made up the participants' strategies to success. The following seven factors, or strategies, contributed to the participants'

abilities to successfully navigate the promotion and tenure process: (1) self- confidence; (2) self-efficacy; (3) personal agency; (4) professional socialization into the professoriate; (5) supportive departmental work-environments; (6) a support system; and (7) an underlying drive to succeed in the professoriate. Four out of the seven strategies were personal factors (i.e., self-confidence, self-efficacy, personal agency, and the possession of an underlying drive to succeed in the professoriate), while three were external factors (i.e., the presence of a support system, professional socialization into the professoriate, and working in a supportive departmental work-environment). The following table **(Table 2)** provides a visual construction of these seven strategies.

Four Personal Strategies	**Three External Strategies**
Self-confidence	Professional socialization into the professoriate
Self-efficacy	Supportive departmental work-environment
Personal agency	Support system
Underlying drive to succeed in the professoriate	

Table 2. Seven Personal and External Strategies: Four personal factors and three external factors made up the strategies that contributed to the successful career advancement for 13 Black and Hispanic/Latina STEM faculty from assistant to associate rank status.

The strategies that facilitated the successful career advancement for the participants consisted of these seven personal and external factors. However, these seven factors were constructed in different ways for each participant to form their individual strategies of success. That is, not every participant's strategy profile consisted of all seven personal and external

factors. What is more, any one of the seven personal or external factors differed in their *level* of presence within each individual. For example, self-confidence may have been present but it varied for each individual from a "strong" to a "softer" or "weaker" presence. As a result of these differing levels of presence, the participants' journeys to success differed, even though all of them attained promotion and tenure. For some, a smoother process ensued while for others a less certain path to tenure resulted.

The optimal strategy combination included a *strong presence* of *all* seven personal and external factors. For those participants, a smoother navigation process of the probationary years developed because obstacles and challenges were greatly minimized. I will elaborate on the details of how and why this was later in this chapter. In contrast, the *fewer* the number and/or *weaker* the presence of the seven factors that made up one's strategy profile, the more trying the path to success. The table below **(Table 3)** represents a contrasting example of two extreme strategy profiles encountered in this study.

Strategy Combination 1		**vs**	**Strategy Combination 2**	
SELF-CONFIDENCE	**PROFESSIONAL SOCIALIZATION INTO THE PROFESSORIATE**		self-confidence	n/a
SELF-EFFICACY	**SUPPORTIVE DEPARTMENTAL WORK-ENVIRONMENT**		self-efficacy	n/a
PERSONAL AGENCY	**SUPPORT SYSTEM**		personal agency	support system
UNDERLYING DRIVE TO SUCCEED	---		**UNDERLYING DRIVE TO SUCCEED**	---

Table 3. Strategy Combinations: A Contrast of Two Extremes: A total of four personal and three external strategies are represented. Bolded and capped lettering indicates a strong presence. Lower-case and non-bolded lettering indicates a softer/weaker presence. Strategies/factors not available are depicted as "n/a". The "---" is a blank cell.

The left hand side of the table above depicts a participant who has a *strong presence* (depicted in bold caps) of *all* seven personal and external factors. This combination of strategies resulted in a smoother promotion and tenure navigation process. The right side of the table represents a participant who has a *fewer* number ("n/a") and a *weaker* presence (depicted in lower-case, non-bold lettering) of any of the seven factors that made up their combination of strategies to success. In the latter case, their successful career advancement was typically more trying. However, depending on the situation and the individual, myriad strategy combinations emerged.

Despite the myriad strategy combinations encountered, four out of the seven factors were present for nearly all participants and made up the backbone of their success. Thus, these four factors are referred to as the "*foundational strategies.*" Three out of the four foundational strategies were personal strategies: self-confidence (12 out of 13 participants), self-efficacy (13 out of 13 participants), and personal agency (13 out of 13 participants). The fourth was an external strategy: a support system (13 out of 13 participants). Accounting for the fact that 12 out of 13 participants asserted having self-confidence, for ease, I have stated that "all" of the participants exhibited these four foundational strategies.

All participant responses included a facet of these four foundational strategies and attributed them to the participants' ability to persevere through hardships and persist toward their goal of tenure. What differed, however, was the *strength* of these four strategies; they varied greatly for each person from a strong to a softer presence.

Critically, these four foundational strategies were largely in place for each individual *prior* to the participant entering the professoriate. Certainly for some participants, their self-

confidence, self-efficacy, sense of personal agency, and presence of a support system remained steady over the probationary years. For others it strengthened or fluctuated.

There were three remaining strategies that were present for some participants, but not for others. Thus, the remaining three factors are referred to as "*variable strategies.*" One out of the three, an underlying drive to succeed in the professoriate (9 out of 13 participants), was a personal strategy. The remaining two variable strategies were external factors: professional socialization into the professoriate (6 out of 13 participants), and working in a supportive departmental work-environment (10 out of 13 participants).

Importantly, two of the variable strategies were key factors that led to marked advantages in one's ability to navigate and to advance one's career with greater ease for whom those these external factors were present. They were professional socialization into the professoriate, and working in a supportive departmental work-environment.

Despite these nuances, an array of these seven personal and external factors accounted for the strategies that contributed to the successful career advancement of the 13 Black and Hispanic/Latina academic STEM faculty in this study. It goes without saying that beyond these strategies, the participants' technical abilities were an undeniable part of their success.

The remaining chapter is organized in the following way. I first report on the four foundational strategies that were present for nearly all of the participants and that were in place prior to entering the professoriate: (1) self-confidence; (2) self-efficacy; (3) personal agency; and (4) a support system. Next, I shift my focus to report on the three variable strategies. I begin with strategy 'an underlying drive to succeed in the professoriate', which also contributed to many of the participants' success. I then illustrate how and why the remaining two external factors, professional socialization into the professoriate and working in a supportive

departmental work-environment, served as a success strategy but also produced a division in the facilitation of the participants' career advancement.

Finally, I conclude with a summary of the challenges and strategies presented in this chapter. The summary includes a visual depiction of three common profiles that made up the success strategies for the participants of this study. I now turn to reporting the four strategies that made up the foundation of the participant's success. To reiterate, these four factors were largely in place prior to the participants entering their first tenure-track position.

Background Matters

Self-Confidence

Twelve out of 13 participants expressed having a sense of self-confidence. This personal attribute contributed to their success. In this section, I address the different ways that confidence was expressed (e.g., self-assurance, resilience, self-worth), what ways confidence played a role in the participant's work-place (e.g., classroom environments, grants, negotiation, keep calm to an uncertain tenure fate, survive a patriarchal discipline), and how confidence was developed (e.g., through a schooling experience, messages received from parents as a child, surviving as a woman of color in America). It should be noted that many participants simply asserted that they were confident and provided only generic statements about how their confidence was developed.

To be clear, this personal attribute was general in nature, meaning it described a personal trait in the broadest sense. The participants' self-confidence should not be confused with their sense of self-efficacy to achieve promotion and tenure. In fact, at least one individual expressed that it was not self-efficacy in relation to achieving tenure that allowed her to persevere to tenure; rather, it was her sense of confidence as a person. Flora explained:

> Right, so I should feel like I'm good at what I do but I really don't feel that way. I don't know why. But nevertheless though, as a person, I'm confident and that helped me in my career even though I might not have the most confidence in my abilities. It still helped, the fact that I'm a confident person.

Flora indicated that her self-confidence was developed prior to her entering the professoriate when she said, "I'm very thankful that I grew up with strong confidence in myself." Another participant said, "self-confidence is a big thing" (Destiny). Destiny started talking about her sense of confidence with a story that included her mother that stemmed back to her childhood, one that was based on having to "know who you are." Related to the topic of confidence, Destiny elicited the deepest inner-workings of her cognitive process when she repeated aloud what she described as her internal mantra. During particularly difficult moments, Destiny would say to herself, "You have to know that I do know this. And I am good at this. Now, are there things I can learn? Absolutely. But I'm good enough to learn it and I think that has to be who you are." Destiny explained why having confidence was useful in her career. She stated:

> If you're a little kind of shy, introverted, not sure of yourself person, and I say this particularly for science, in hard sciences, is not where you need to be because it's still male dominated. Not as much as it used to be, but it's still male dominated. (Destiny)

There were a variety of ways that self-confidence was described and demonstrated. For example, several participants attached self-confidence with other attributes such as self-worth, self-assurance, and resilience. Further, some participants described themselves as being driven, tenacious, and even stubborn. Though these sentiments were described in a variety of ways and with varying levels of strength, it was the importance of its presence that the

participants conveyed. For instance, one participant described how an unruly cohort of engineering classroom students resulted in her faculty colleague walking out of teaching the class. Jasmine was assigned to teach that same group of students. However, Jasmine attributed her ability to handle this classroom environment early in her career, in part, to her confidence. Jasmine stated in an assertive tone:

> …I come across very confident and very self-assured and I also, you know, I start off saying that 'I don't know everything and learning should be a two-way street. So there are gonna be some of you who might know more than I do and I'm okay with that. As long as you're respectful about it'.

She concluded, "I was never afraid to say what I didn't know" (Jasmine). Jasmine's confidence also stemmed back to her upbringing. She informed me that whatever the endeavor, she always carried with her a sense of options and choice in her life. Jasmine stated, "'I'm gonna have options' goes back to how I was brought up. My dad always, always instilled in me, 'you can always go home'." As a result, Jasmine said, "I think that sense of self and that notion that it's not a dead-end…right? 'You have choices' also gave me a certain amount of confidence." Her self-confidence worked in her favor with respect to keeping calm about her tenure fate. Her mindset was, "if this doesn't work out, I'll go do something else" (Jasmine).

Another participant said, "I do feel that you have to have this strong sense of self, and self-confidence in order to be successful really in just about anything" (Maria). Maria's comment indicated that this personal attribute was beyond the one goal of making tenure. Maria said that for her, possessing this trait often resulted in her having no hesitation talking to people in general. She stated, "…I feel quite confident in my sense of self to be able to go up to just about anybody and ask a question or get clarification or, you know, negotiate with someone"

(Maria). This helped to facilitate Maria's career when it came to negotiating her teaching load and with establishing herself as a researcher in a new field, for example.

Maria asserted that her sense of self was initially established in high school. However, being the first person in her impoverished high school's history to be accepted into an Ivy League institution, being away from her family as a Hispanic/Latina undergraduate across the country for several years, and further having completed her undergraduate program successfully, Maria stated that she never again questioned her ability to be successful. Years later, her confidence played a role in overcoming the difficulty she had in securing external grants early in her career:

> …it's been difficult with grants…it's hard because it's harder to get grants these days, expectations are higher but I guess I've always had that strong sense of self-confidence and strong sense of self from the very beginning. So for me, it's never been a question of whether or not I can do this. It's just a matter of figuring out how to get it done, how to go forward in order to be successful. (Maria)

In fact another participant, Sweet, suggested that being self-confident as a person may even be slightly more important than possessing a strong sense of self-efficacy to tenure. In reference to confidence, Sweet stated, "I know we talk a lot about self-efficacy and stuff, but I think that's huge" (Sweet). She explained the basis of her remark: "Because people are gonna try to rattle you no matter what you do. And so I think you have to have a healthy dose of confidence and resilience" (Sweet). Sweet concluded, "And you have it. I mean, just to survive as a Black or Latina woman, you have to have some level of resilience to be here in America."

The examples above highlight that self-confidence was an important strategy utilized to handle work-related challenges for the majority of participants. Some participants' levels of

confidence were less so and/or fluctuated depending on the degree of the particular hardship. Self-confidence was expressed in a variety of ways, it was developed differently for each person, and it played a role in advancing the participants through work-related obstacles. What is most important is the revelation of its presence within each individual prior to stepping foot into a faculty position.

Self-Efficacy

The second strategy, present among all participants, was that of self-efficacy. Two patterns of this cognitive judgment emerged. The first was the participants' self-efficacy in relation to performing specific activities/tasks in a way that they believed would bear the outcome of tenure. The second was the participants' self-efficacy in relation to the goal of making tenure in general, even if they had a low sense of self-efficacy about a particular task (for example, how to write a successful grant). Depending on the individual, one or both types of self-efficacy patterns were observed. Although the primary objective of this study was not to examine how self-efficacy was developed or to determine why each of the four sources is important, the conclusion of this section comments about critical observation in this regard.

Jasmine was one participant who did not necessarily express self-efficacy about attaining tenure, but displayed a high sense of self-efficacy regarding her capability to perform a specific activity/task -- in her case, to secure external grant dollars. This was fueled by her belief in her own work and in a belief in herself.

Jasmine shared that she had a difficult time gaining traction with funding as late as mid-way through her tenure clock. This not only negatively affected her ability to publish, but it also resulted in her feeling a silent questioning by her colleagues regarding the value of her research. However, it was Jasmine's belief in her personal capability to write a successful grant that

enabled her. Jasmine expressed that she thought to herself, "somebody's gonna get some money to research what that means. Somebody's gonna get some money to develop tools to measure that. Why couldn't it be me?...just the belief that I could be the one to answer the question." Thus, Jasmine did not retreat. Instead she persisted, she kept writing, she kept trying.

Jasmine's strong belief in the value of her own work and in herself contributed to her approaching, versus avoiding, the initial funding set-back that she faced. Jasmine stated:

> At the end of the day, the thing that I said to myself was, 'you know, I believe in my work and this is, I'm gonna build my, I'm building my career around this idea that I have, the thing I wanta do. It's either gonna work or it's not and I'm gonna live or die trying'… I believe in my work and the value of what I'm trying to do. And so I'm not gonna waver from this.

Eventually, Jasmine secured a solid level of funding that in turn allowed her to successfully move forward with her agenda. In contrast, Ava expressed a low level of self-efficacy about the task of grant writing as a probationary faculty member. She said, "So *my* issue was not knowing how to write grants well…" (Ava). Ava proceeded, "And while I could get small amounts of money… I never could get large amounts of money."

Even though Ava displayed a lower level of self-efficacy about this critical activity, she held a strong belief in her ability to make tenure overall—the second theme observed in this study**.** Ava said this about her self-efficacy in relation to making tenure:

> Believing in myself. I always just kinda…if other people are doing it [getting tenure], it can't be that difficult. It's always been one of my mottoes and so, I've gotta find out how that works for me. So I think that I just felt that I could do it. And I never ever thought that I wouldn't pull it off.

Thus behaviorally, what ultimately fueled Ava was a belief in her capability to make tenure, even though she had a low sense of self-efficacy about grant writing. Ultimately, Ava garnered enough external support to keep her research activities going, which allowed her to publish and ultimately get tenure.

Olivia, on the other hand, showed strong signs of self-efficacy in her capability to perform teaching, research, and service activities/tasks effectively as well as a strong belief in her wider ability to make tenure. As a result, the challenges that Olivia faced in these domains were minimized in part due to her strong self-efficacy about her capability in these areas. For example, though the majority of her student course evaluations were excellent, I highlighted earlier in the challenges section that Olivia discussed the experience of recurrent gendered feedback. Although she expressed a low level of background annoyance, Olivia carried on unscathed by what she described as "ridiculous" student evaluation complaints about the teaching and learning that occurred in her classroom because she believed firmly in her teaching abilities. Olivia said, "I am absolutely certain…I consider myself a very good teacher in the classroom."

Further, while several participants were overburdened with service requests or engaged too heavily at the expense of their productivity, Olivia and other participants were also extremely self-efficacious about service activities. In other words, Olivia held a strong belief in her ability to carry out a heavy service agenda while maintaining her research productivity. Her self-efficacy in relation to service allowed her to perform service activities successfully while maintaining her research productivity. She expressed:

> And so if you look at the service aspects that I do and the fact that I've made a decision that the time I spend doing that is going to take away from the time I could spend doing

my research, that's a choice I've made and I've made peace with that….I'm happy with that. This is who I am. This is what I want to do. (Olivia)

Since Olivia was also self-efficacious about her capability to secure funding and to publish her work, she was in fact able to produce competitive outcomes in these arenas while also fulfilling a service agenda targeted at Hispanic engineering students. What is more, Olivia was able to generate substantial external dollar amounts such that a pre-existing issue of laboratory space was resolved by her second year on the tenure-track. Olivia explained:

> At the beginning, it was shared lab space so, you know, half of the room was mine and half of the room was another faculty member. I did not like that. But within about two years, the entire room was mine because I started bringing in a lot of money. And the other faculty member didn't have money. So you know, you have money, you have research projects, you need some space so the other faculty member was asked to go occupy another smaller room and I took over.

In addition to Olivia having a strong sense of efficacy about her activity capabilities in relation to teaching, service, and research, like Ava, she also believed in her wider ability to reach the goal of making tenure. Olivia's strong sense of self-efficacy about her ability to perform the activities necessary to make tenure came through in her comment about her thoughts as her packet went under review, "And, so, I wasn't that worried about it," "…the packet went smoothly. There was just, there was no, nothing. Nothing to prevent it" (Olivia). The extent and level of strength that each participant held about their self-efficacious beliefs varied, whether it was about making tenure, about a particular activity/task, or both. Nevertheless, in most cases self-efficacy in either or both of these domains played a role in assisting the participants to mitigate or overcome what barriers they faced.

Though the focus of this study was not to analyze the details of how self-efficacy was developed nor to investigate which of the four sources were most critical for women of color faculty, the following observations are too important to ignore. As previously noted, I observed that the participants' self-efficacy beliefs were largely shaped over their childhood and formative years. Cumulatively, the participants uncovered a spectrum of experiences that fell into one or more of the four sources known to develop self-efficacy about particular activities (e.g., performance accomplishments, vicarious learning, affective states, and verbal persuasion).

Although all four sources were cited, most of the participants (10 out of 13) mentioned the importance of having role models (vicarious learning), followed by words of encouragement (8 out of 13 mentioned verbal persuasion). Thus, vicarious learning and verbal persuasion were major influences in the development of the participants' beliefs about their capabilities. In particular, this influenced the participants' beliefs about their technical competencies and skill-sets as they moved forward into their STEM careers.

Interestingly, my findings indicted that it was not only verbal persuasion but also the circumvention of negative messages that contributed to some of the participants' self-efficacy beliefs in their ability to develop successful STEM careers. One participant put it this way, "…sometimes when you don't know that you're supposed to have challenges, you just do what you do and do it" (Destiny). Another participant, Sweet, elaborated that in high school she got interested in technology and "didn't know that [it] wasn't something typically associated with girls or minorities." She stated, "…those barriers weren't there…I didn't really connect that it was a man thing. So in terms of that stereotype and stuff, I just never saw it that way" (Sweet).

Further, the role of strong affective states and strong emotional resolve was an essential strategy for those participants who possessed this capability. Having strong affective states were

especially useful to minimize or to overcome racialized and/or gendered experiences. For example, Maria credited her strong affective state to being able to mitigate one such work-place incident. In one occurrence she suspected that it was an aspect of her intersectional existence (being young, being a female, being a Hispanic/Latina) that played a role in prompting an older, established White male professor to feel that he could patronize her after she presented novel results at a research meeting. Maria explained the back story:

> [I] was describing my results, this was before we had published anything so this was the first he'd ever heard of this. So this was some new thing that might've been kind of a shock for him, for someone who's been studying this field for so long and then to have this new thing be presented by some person he'd never met or heard of or anything like that.

Maria then recounted that as she was leaving the meeting this faculty member approached her and said, "'oh, well, that's a really interesting research project you've got going…I'll let you work on it for one year and then I'm gonna start working on it'" (Maria). Maria described her emotional response:

> I was just shocked. I'm like, really? Inside my head, is that a joke? Or not really? I mean, you would never say that to somebody else, that 'I'm gonna start working on something that you're working on'. But you know, he felt he could because this was his field and he was giving me a sort of a year lead time so he thought he was being fair, I guess.

I asked Maria if she responded verbally to the senior male professor. She replied, "I didn't say anything. I think I just stared at him…so you know, *that* kind of thing" (Maria). Maria could have easily been intimidated or could have let that type of interaction negatively

affect her. However, Maria explained that it was her upbringing that had "given [her] the ability to handle lots of adversity," so she said, "I didn't get upset…just kind of let it slide off me…" said Maria. It was clear that Maria credited her upbringing to her ability to handle potentially adverse emotional affairs. In this case, she utilized her strong affective state to prevail over this work-place incident en route to tenure. Maria concluded about that particular research activity, "you know, it did motivate me to work hard and get a paper published in a high profile journal…"

Any one of the four self-efficacy sources (performance accomplishments, vicarious learning, affective states, and verbal persuasion) played a role in the success of the participants because it made up their sense of self-efficacy. In turn, self-efficacy accounted for ways in which participants were able to rise above any number of challenges related to attaining promotion and tenure.

Apart from this, the stronger developed one's self-efficacy was in relation to a particular activity/task, the less the participant dwelled about the potential outcome of failure for those activities. Alternatively, even if a participant had a low self-efficacy about a particular task, the participants then typically held a strong sense of self-efficacy about meeting the tenure goal at-large. Because personal agency is a product of self-efficacy, it was not surprising then to find that all participants also exhibited a level of personal agency that allowed them to take action about their self-beliefs.

Personal Agency

All participants showed evidence of personal agency, that is, forming judgments and actions that were at least partly self-determined. The ability of the participants to make choices and action plans in a way that turned around challenges, partially contributed to how and why

they were able to moderate or defeat posed obstacles. Through the possession of personal agency to take action through the number of obstacles placed before them, the participants steadily advanced to tenure.

Although each participant set out to accomplish the same goal of achieving tenure, like self-confidence and self-efficacy, the *level* of personal agency that each person held across any particular action-area varied. Further, depending on the individual, action plans were carried out in a variety of ways under differing circumstances. The following challenge areas illustrate where agentic behaviors were enacted: service, navigating vague promotion and tenure requirements, constructing a research agenda, balancing ethnic/cultural values with mainstream cultural values, and work-life difficulties.

For example, for many of the participants saying no to service requests, combined with a constant bombardment of them, proved to create a challenging situation. One participant, Ava, expressed that writing got away from her directly as a result of her saying 'yes' to service requests constantly. Ava recalled an experience about a campus office that constantly sought her out for student-related service requests:

> …I began to see that I was helping them with the work they needed to do in retention and in programming for students. But they couldn't help me with the work I needed to do…I was being asked…but it wasn't reciprocal. So I began to see myself that I was being pulled away, you know, at least like 50% of the time to do all of these other things. But that wasn't happening, that wasn't coming back.

Taking the time to reflect on her situation, she realized that indeed, she was being pulled in too many different directions, and she ultimately realized that it was negatively impacting her ability to write and to publish. As a result, Ava adjusted her game plan and took action. She

said, “And then I did start to say no.” Even though Ava still felt a sense of obligation, she created an action plan that ameliorated this challenge. Ava explained what her action plan entailed:

> I tried to channel things differently. Instead of doing as many things, like Black family day, which was a long planning thing… I pulled back from that. But I would do the programs that would take high school students into the laboratory in the summer.

Ava stated that her intention was to merge her research activities with her sense of duty to assist students. Personal agency was also exhibited in relation to challenges previously presented, such as having to navigate vague promotion and tenure expectations. As previously presented, most participants did not have information as to the exact number of publications or grant dollars needed to make tenure. Many participants were nevertheless able to work around this issue in some capacity. While some participants proceeded without much planning in this regard, others thought about this predicament and formed intentional plans of action in effort to soften this obstacle.

One participant noted, “You have to have some reasonable level of publications, some reasonable level of funding that is comparable or better than your colleagues in your own department, in your own college, at that institution” (Olivia). Though perhaps subtle, this remark implied that Olivia formed an idea as to how she planned to go about navigating a vague, yet ‘reasonable’ numerical marker to remain competitive before she actually executed this strategy. Olivia did in fact self-monitor her productivity such that her publication and funding levels were comparable or better than colleagues in her department, in her college, and at her institution. Olivia described that by using the internet she would “look up” CVs and other pertinent publically-available data or that she would proactively hold conversations with her colleagues in

and outside of her institutions. As a result, Olivia was able to successfully achieve the desired outcome for which she aimed.

Olivia's agentic behavior was not only useful to address challenges that she was faced with, but also to circumvent challenges. Through forethought, one of the four agentic properties that make up the development of agency, Olivia was able to construct an appropriate course of action for her future research plan such that her desired outcome of having an organized research agenda materialized and obstacles related to lag time were avoided. She began by taking into consideration that she was probably not going to have the major pieces of equipment needed to conduct certain projects immediately. Olivia asked herself:

> …what are the things that I can do in the first six months that are going to only require a few things in my lab? And then what is my plan in terms of acquisition so that within the next six months, I can now start doing the larger, more expensive things? And how am I going to organize it in such a way that at the end of say two years, I'm going to have a very well organized research plan that now includes most components of a research agenda?

Olivia's anticipated outcome of having an organized research plan two years down the road guided her immediate choices regarding how she proceeded with her laboratory and experimental set-up. Maria, on the other hand, utilized personal agency to strategize around integrating her Hispanic/Latina cultural values to her professional mainstream expectations. Her action plan consisted of running her science laboratory with a family-oriented leadership approach. Maria said, "I do feel that I approach my research laboratory team as more of a family as opposed to a, you know, group of professionals." Maria elaborated, "So I'm interested in having, you know, good people in my lab that are good scientists but also that are friendly and

get together." She closed with how she was able to execute both her personal and professional spheres. Maria said, "I'm a lot more open to both personal and professional issues for my team members as well…as any of the advisees or students that I mentor on their dissertation committee" (Maria).

Finally, another area where participants made choices that led to desired outcomes was for working mothers who were on the tenure-track. Recall from the Hispanic/Latina-focused work-life challenges section that Flora was required to return to work by the first of October and was also expected to maintain the same level of productivity despite her ill-allotted time to transition after childbirth. Further, based on her cultural norms Flora was also expected to fulfill a traditional care giving role at home. Flora demonstrated an ability to construct an appropriate course of action despite her obstacles and based on her shifting context. Though strenuous, this allowed Flora to achieve a productive outcome. She explained, "…before, I could come home and after dinner just work on my research, but once I had my child, then I couldn't do that" (Flora). Flora executed a new action plan where she would "…wait until perhaps 10:00 at night to sit down" (Flora) and use that time to "work on my classes rather than on my research because that time was gone" said Flora. Ann shared a similar action plan after having children. She stated:

> I'd get up at 4 in the morning and work. You know, so I would have dinner with my family and we'd have time and we'd go to bed and I'd get up at 4. I tried to sort of separate, here, we're just gonna hang out and not work in the evening. But now, now I gotta get up and put in the time.

As previously noted, all participants showed evidence of forming judgments and actions that were at least partially self-determined to advance through a number of obstacles and

barriers. I have elected to report how the participants' agentic behaviors appeared in ways that allowed them to overcome challenges faced amidst the tenure-track. However, based on the descriptions provided by the participants, the development of these agentic behaviors stemmed largely from experiences over their childhood and early adult years. The level of agency differed from person to person and the particular practical actions that each participant took also differed from situation to situation and from one context to another. Most important is that the findings pointed to an existence of personal agency, one where all of the study participants were not paralyzed with fear but rather took proactive practical steps to work through whatever challenge was at hand.

Thus far, three personal strategies have been presented: personal agency, self-efficacy and self-confidence. These strategies were found across all participants and contributed to the participants' career advancement by enabling participants to move through obstacles and persist to tenure with respect to handling service challenges, vague promotion and tenure requirements, issues related to the development of a research plan, challenges with balancing ethnic/cultural values, and work-life issues. The fourth strategy uncovered in this study was an external factor: a support system. Together, these four foundational strategies were largely in place prior to the participants entering the professoriate.

Support System

Upon entering the professoriate, all participants had a basic *personal* support system in place. Having a personal support system in place was a key strategy because it offered an emotional and psychological outlet for the participants. The participants relied on their personal support system to cope with issues such as job stress, bicultural stress, work-life balance,

gendered/racialized experiences, and with handling work-induced personal issues such as relationship strain.

Beyond personal support, a handful of participants also had a *professional* support system in place upon entering the professoriate. This served as an additional strategy because it complemented their personal support system to create a more comprehensive system of support. Theis handful of participants readily had available a greater network of individuals who could offer professional/disciplinary mentoring and help with work-related obstacles as they arose. The extent and make-up of each of these distinct support systems varied for each participant. Although a key strategy was to have at least a basic personal support system in place, in most cases, both personal and professional support systems expanded over the probationary period.

Personal support. As indicated above, the majority of participants relied on a personal support system to cope with the emotional and psychological impact created from a number of work-induced stressors. The extent of personal support systems varied from one key individual upon whom the participant could rely, such as a spouse or a sibling, to a more extensive network of individuals on whom participants called for support. Typically, personal support systems included partners/husbands, friends, family members, "professional peer" colleagues, and professionals (e.g., therapist). Although the participant's personal support system overwhelmingly involved individuals, Sally mentioned "faith" and Ann "exercise," which were also mentioned as to what made up one's personal support system.

Flora was one participant who expressed that it was her siblings who helped her cope with stresses of the job. In reference to her siblings, Flora stated, "I'm very close with my family…I talk to them very, very regularly and just about things in general, not about my career" (Flora). Flora continued, "Even though they're into academics and everything, still [we] just

don't talk about career…we just talk about other things." Even though Flora did not talk about career challenges with her siblings, she asserted that this outlet nevertheless helped her to cope with the stresses of her job. Flora said, "Absolutely. Absolutely. Having the family's support made a big difference…that was definitely kind of the constant in my life that just kept me going." Flora's latter remark indicates that her personal support system played a role in her persistence. Specifically, Flora cited that this outlet helped her in her career because it reminded Flora of who she was and it allowed her to be herself.

"Professional-peer" colleagues were also a part of many participant's personal support system; however, these peer colleagues were distinct from other individuals such as friends, parents, or sibling. Professional-peer colleagues made up a unique aspect of the participants' personal support system because they could assist participants through personal matters such as divorce, yet they also understood the details of academic work-place happenings. Although Flora did not meet this peer colleague until five years into her early career, the following excerpt illustrates the point. Flora explained:

> Then in my fifth year, that's when the problems at home started and I started going through the process of divorce, and so it was this colleague of mine with whom I would talk about what was happening and then the following year, she went through a divorce so then I was there for her. So we have been support for each other. So yeah, that's one person because she knew exactly the situation at work, she was in my department, I could talk to her.

Although Flora and her colleague were in the same department, Flora described the role of her peer colleague as one who provided her with personal, not professional, support. Sweet,

however, did have peer colleagues in place that she could turn to at the onset of her career. In Sweet's case, her peer colleagues assisted her through the negative effects of tokenism.

Sweet shared that she had a support system in place that involved peer colleagues from her doctoral student years. She explained that as a doctoral student she was involved in a program that supported individuals who planned to enter the academy. Sweet said that a main objective of the program was "to build social networks so that while you're a student, you network with other Black, Latino and Native Americans who are also doctoral students so then you can, you'll be colleagues when you go off into your faculty positions" (Sweet). Although Sweet was able to fold part of this network into her professional support system, Sweet spoke about how her professional-peer colleagues served to support her through personal emotional and psychological stresses as a result of her tokenized context.

"We just help each other out…we just all need each other" Sweet said. These peer colleagues provided personal support to Sweet (and vice versa) because, as Sweet explained, "We're all like the *only* one in our department. So…we really have to work together. Cuz we can talk about things no one else understands" (Sweet), in reference to the feelings she experienced as being 'the only one'. Sweet also affirmed that this personal support system played a central role in allowing her to persist.

Some participants had a more extensive personal support system in place at the onset of their careers compared to others. Even though the extent of in-place personal support systems were more extensive for some than for others, an important revelation was that a personal support system did not necessarily need to be extensive in order to provide retention and persistence benefits for the participants.

For example, Isabel had one key person she spoke about—her sister. Isabel was one participant who talked about lacking a professional support system upon entering the professoriate; however, her personal support system played a role in her persistence strategy. Just as Isabel was leaning toward leaving the professoriate as a result of cultural work-life issues, Isabel turned to her sister to talk through this critical moment in her career. Isabel recalled:

> I had a long conversation with my sister who's actually older than I am and I, you know, I was telling her 'I'm just really not sure whether I can really do this. I'm thinking maybe I should just, you know, maybe step it down'…She said, 'absolutely not'. She said, 'you will be miserable'. Those were her exact words. (Isabel)

This critical conversation with her sister ultimately resulted in Isabel's retention and decision to persist. The majority of participants concurred that their existing personal support system attributed to their persistence because it allowed an outlet for them to vent, to deal with emotional/psychological hardships, and to seek advice.

Professional support. Beyond personal support, a handful of participants also had a professional support system in place upon entering the professoriate. This complemented their personal support system and created a more comprehensive system to also include disciplinary mentors, professional colleagues, and research collaborators. In addition to receiving professional guidance, a professional support system also allowed participants to tap into a greater network of information to solve personal, professional and disciplinary-related problems as they arose.

For example Jasmine stated, "I grew up fairly well networked." Jasmine offered an explanation as to how her professional support system was assembled. The first opportunity was related to family. Jasmine's father was a well-known academic in [a disciplinary] area who also

ran a national disciplinary organization. As a result, through hosted dinner parties by her father, Jasmine was exposed to and formed relationships with a number of industry and academic leaders. For example, she stated, "I probably knew all the deans of the top 50 engineering schools by the time I was 15" (Jasmine). This contributed to her professional network. Much of Jasmine's professional network also stemmed back to her graduate school days.

She explained that her involvement in a professional disciplinary organization allowed her to meet many professional Black women engineers who were now also professors throughout the country. As a result, years later she was able to pick up the phone and easily call a handful of academic engineers if she needed advice about a particular professional difficulty. "I could just go down the list. Let me call this one. Let me call that one. Let me call this one, let me call that one," said Jasmine. Jasmine explained that her professional support system was extensive and included academic peer-colleagues who were a couple of years ahead of her, graduate school advisors, established faculty members and others. She highlighted the different dimensions of her professional support system. Jasmine said:

> So I always had like a couple people across campus that were more senior that I could go to. I had some people, you know, on campus that were peers that I could go to. And then I have a huge network outside of my institution because I've got my major professor, [and] I've got people that I went to graduate school with.

Jasmine's professional network also included disciplinary-specific professional-peers. As mentioned earlier, professional-peers occupied a unique space in one's support system. In Jasmine's case, however, the use of some of her professional-peers tilted toward professional, disciplinary-specific advice for issues that were often entwined with race and gender. Though she did not provide further detail, Jasmine commented about use of her disciplinary professional-peer colleagues:

> So in a situation where if I had an issue, as being a Black woman, and I wanted a sounding board to talk to somebody, I'm not gonna go talk to my White male department head, but I'm gonna pick up the phone and call one of my sisters in the academy.

Although Jasmine's strategy profile consisted of several factors, one important strategy to her career advancement was her personal and professional support system. I asked Jasmine, "What do you believe contributed to your successfully achieving promotion and tenure?" She replied, "I'd break it off into A and B. I think one was…the mentoring, the professional mentoring that I got…and then B) would just be the [personal] support system."

For the handful of participants who had a professional support system in place, the extent of this system greatly varied. For individuals such as Jasmine above, a vast network of professional disciplinary mentors and collaborators was available. The participants who had a less extensive professional support system often struggled more compared to those with an increasingly extensive system. That is, those with a less extensive professional support system had fewer individuals to whom they could turn for professional advice and guidance. However, this was not always the case. Similar to what was observed with the personal support system, sometimes having one key individual was all that was needed.

For example, Flora did not have a vast professional network but she had one key and reliable disciplinary collaborator on whom she counted through her probationary years and beyond. This single individual played a vital role in supporting her research endeavors. When they were not collaborating Flora found her collaborator's feedback critical because "he was older and he had done research before so he kind of had an eye for research" (Flora). Because their research areas overlapped, Flora was able to consistently rely on him as a sounding board. She said, "…he was the one I would talk to when I would write a paper and I would send it to him and say, 'hey, I'm going to send this to this journal, what do you think?'" (Flora). Since

research and publishing activities were a critical performance area for the majority of the participants, this lone collaborator was an essential strategy of her professional success.

Expanding the support system. All participants had a basic personal support system in place upon entering the professoriate. For a handful of individuals, a professional support system was also in place. In both cases, the extent and make-up of the participants' support systems varied from extensive to less so. Although this was an important strategy to their success, many participants' personal *and* professional support systems expanded over their probationary years. In general, it was primarily the participants' professional support system of mentors and collaborators that expanded.

Developing a robust professional support system made a significant positive impact on participants' careers, notably for those individuals who did not have such a system in place. Engineering was one such participant who entered the academy with the support of her family and later her partner. Initially, she lacked professional mentors, collaborators and guidance. In the end, however, Engineering said this about what she believed ultimately contributed to her successful career advancement: "the key was to find a set of mentors, a group of mentors that want you to succeed." Although it took her five years to build this professional support system, Engineering said that it was worth it because each person helped her professionally in different ways. For example, Engineering mentioned that one person assisted her with her research agenda, while "the other person helped [her] find ways to fund projects" and that she also had "a group of people" (Engineering) that she would meet "once or twice a month," depending on the problem.

Although the expansion of the participants' professional networks occurred more often than the expansion of their personal support systems, Avignon and Sally's personal support

system expanded to include a therapist. In Avignon's case, it was through the adoption of this strategy (expanding her personal support system) that she was able to successfully cope with bicultural stress, the negative effects of tokenism, and with having to navigate a gendered and racialized academic landscape. Avignon asserted, "I started seeing a therapist. I thought that was a good thing to do, especially since I was isolated…" She described one of several issues behind her need to expand her personal support system. In the example below, she talked about having to navigate a gendered and racialized academic landscape:

> I know this for sure, lots of people in my department are not racist but it's not so easy for people to have a casual conversation with me because of the demographics. A lot of these older White males have never, like they're scared to talk to me. (Avignon)

Avignon continued, "You know, I enter a room and, you know, it's a very different response. So I have to deal with that *all* the time. I've been in this department for ten years and people are still not comfortable with me." Avignon asserted that seeking this support helped her greatly in her ability to cope. "I would sit with this woman…she works with the university as a…researcher, studying academia, women in academia, minorities in academia. So she was *really* helpful, having these conversations with her," said Avignon. Avignon stated why this outlet was helpful to her when she said:

> That was just so, you know, enlightening and because of my nature, I accepted…complete and total responsibility for my difficulties and my struggles and she kept saying to me, 'yes, yes, yes, it's difficult but you're going against an institution that's not designed or made for somebody [with] your cultural upbringing and it's really hostile towards women. Don't forget that'. So she would always remind me of the enormity of what I was trying to do.

Even though some participants had a vast support system while others only had one key person to turn to, on average, most participants managed to develop a handful of reliable individuals that ultimately made up their personal and professional support system. Sally was one such participant.

Sally described the number of individuals who made up her personal and professional support system as "just enough." Although she started off with only a personal support system that consisted of her parents, her husband, and her father-in-law, over her probationary years her support system expanded. Sally's personal support system expanded to include a therapist, and her professional support system expanded to include two key disciplinary collaborators. This small but reliable set of collaborators facilitated much of her joint grant and research activity ventures that contributed greatly to her publication record. Along with her religious faith, this system of six made up Sally's personal and professional support system and carried her through to the end of her probationary period.

The development of modest to robust professional support systems over the probationary years allowed participants to receive disciplinary advice that helped them to better navigate the promotion and tenure process. Having a professional support system in place upon entering the professoriate, however, was to an even greater advantage. The more extensive the personal and professional support systems in place at the onset of the participants' career, the smoother the promotion and tenure process went for them due to the increased availability of personal and professional support to them. Nonetheless, all participants possessed at least a basic personal support system that served as a key coping strategy as they underwent the promotion and tenure process.

In sum, thus far I have reported on three personal factors (e.g., self-confidence, self-efficacy, and personal agency) and one external factor (a support system). These four factors made up the foundational strategies that were largely in place *prior* to the participants starting their tenure-track position. Despite their varying levels of strength, these four strategies formulated the foundation of the participants' success. Together, these four strategies enabled the participants to persist in the face of adversity. They allowed for the participants to manage or to overcome personal, organizational, and disciplinary related challenges, and ultimately contributed to the faculty members' successful career advancement. Next, I report my findings on the three variable strategies. I begin with a personal strategy: an underlying drive to succeed in the professoriate

Underlying Drive to Succeed in the Professoriate

Unlike the previous four strategies, the fifth strategy was present among most, but not all of the participants. Nine out of the 13 participants provided one or more reasons behind the drive to succeed in this particular professional capacity. Critical agency (e.g., resistance, oppression), career fit (e.g., passion for teaching, research, and/or service) and broader aspects of working in the professoriate (e.g., tuition benefits for children, flexible work schedule, intellectual autonomy) were recurrent themes that accounted for the participants' drive to succeed.

Critical Agency

Avignon captured the essence of what the fifth strategy was about. She said, "For a woman of color entering academia, I think the most important factor that will determine her success will be her, what's driving her" (Avignon). Avignon continued, "If she is a pure scientist, if she is just solely interested in the scientific question, there will be no problem at all."

She continued, but, "…that for a lot of us, the bigger picture is important—family, friends. You know, being nurturing. The importance of a partner. Sort of, traditional gender roles at home. Those are severe obstacles to surviving in academia."

For Avignon, it was important for her to resist existing social norms of minimal racial diversity in the professoriate. She expressed how the role of critical agency was a part of her underlying drive to succeed. Avignon said:

> I couldn't fail…and being a minority was an important part of that. I was like, 'I can't be Black and not make it. It would ruin it for so many other people. You know, I have to make it. It was not, it was beyond me. And then, you know, there were the students that I taught and, well, what message would I send if I failed?

Not only was Avignon aware of her position in society, but both majority and racially underrepresented students also reminded her often through their comments. Avignon said, "I had so many students come up to me and say, 'I've never had a Black science teacher. I've never had a Black teacher…" Avignon concluded about her underlying drive: "I'm at odds culturally with this place but I also have the ability over time to influence and to change the professoriate, at least in my little group…" Additionally, Avignon cited her childhood dream to make a large scale impact in science and education as another key driver of her persistence. "I still believe in my future self and what I'm going to be able to do, to fulfill that childhood dream," said Avignon.

Six of the nine participants who mentioned the importance of having an underlying drive to succeed in the professoriate elicited that critical agency played an important role in their drive to succeed. For some, such as Avignon, critical agency played a role in her overall drive to make tenure. For others, such as Sweet, critical agency influenced her decision-making as it related to

pursuing specific research-related activities in a successful manner. Sweet began by expressing her understanding of the negative effects of racial oppression on people of color in US society. She said:

> I mean, I'm just a Black woman and I'm just not feeling this whole cyber security thing because I know what kind of people, in general, the military does exploit poor and minority people…yeah, just the whole framing of who's a terrorist and stuff, it doesn't work for me, being a person of color. (Sweet)

Sweet proceeded to explain that most of her research decisions were motivated by her position regarding the oppression of people of color and leveraged her research to act against it. She explained that her publications "…all revolve around theories and explain how culture reproduces people's social status. And so, a lot of it is dealing with race and stereotypes and how people perceive their race and how that influences their technology choices…" (Sweet). Sweet's awareness of the effects of oppression fueled her research inquiries and motivated her to secure funding.

Another participant talked about elements of her career purpose as it related to critical agency. When I asked Olivia what contributed to her success she replied, "…it's about leading a purpose, purposeful *life* and deciding what is important to you and *doing it*." She proceeded to explain what her purpose was. Olivia said:

> …to help people, too. I mean, that is one of my purposes, right? That is why I am very involved with [organization] because you know, I see issues with Latino education…it's not all just the research. We have the research and we have the service components associated with my activities with the Latino community. *Those* are purposeful things for me. They're important to me.

In Olivia's case, her essential purpose led her to make a choice in her career to link her productivity in the areas of research and service in order to address broader racial and social concerns. This played a role in her motivation to make tenure. By making tenure to associate, and eventually to full, she explained that she would be able to make an even greater impact on Latino education. Olivia stated, "I'm going to help the Latino community…in increasing the number of Latino engineering professors in this country. Which is a big goal that I have over the next 20 years, by the way." One way Olivia planned to make an impact is by becoming a member of the National Academy of Engineering. Olivia said, "…and the goal that I set for myself over the next 10 to 15 years is I wanta become a National Academy of Engineering member." She hinted to the fact that she would need tenure as one ingredient to reach her ultimate goal, "What do I need to do in order to do that?" said Olivia in referencing her goal to become a member. Without becoming a prominent contributor in her field, beginning with making tenure, the chances of reaching her goal would be minimized. In addition to critical agency, career fit was another driver for some participants.

Career Fit

With respect to career fit, Olivia and Engineering truly enjoyed teaching, research, and service—a strong career fit overall. Typically, however, there were one or two areas that were favored over others. One participant, for example, realized that she absolutely did not enjoy research. Beyonce said, "And what I found was that I had to *force* myself to do [discipline] engineering research. I did not enjoy it and it ended up literally stressing me out just so much. I had ulcers, it was so bad." This made the tenure journey more difficult for Beyonce, but her strong passion for teaching and working with students drove her. Beyonce stated:

> But what I did find was that I absolutely *loved* working with the students. I loved, I loved teaching class. I loved working with the student groups and the undergraduates. I loved mentoring the students that came in, and encouraging them and supporting them and telling them, and helping them be successful. But I found something that I *really, really* like doing and I found a job that enabled me to do those things.

Finding a career in the professoriate was an important driver for Beyonce. Despite Beyonce's disdain for research, there was a strong career fit in other aspects of the job. That is, Beyonce held a great passion for teaching and service and she was not willing to give that up. For others, such as Sally, her initial passion for research remained her primary driver over teaching during her probationary years. Sally recalled, "…when I first thought of being a professor in grad school, I thought, I don't wanta grade papers, you know. But it's sort of like, it's like I love science and I'm good enough in math…" Sally asserted that it was her passion for research that continued to drive her.

Broader Aspects of the Professoriate

Broader aspects of the professoriate was a third important driver for the participants. For example, Ava was a single mother who said, "My priority was, you know, a good job, of course, with a Ph.D. so I could take care of my daughter and myself and to have as much flex as I could in a job possibility because she was going to be a teenager and I needed that flexibility." Although Ava also looked into industry jobs, she said, "their flex wasn't the kind that I wanted." Ava continued, "…it wasn't really flexible like university is flexible. I've got a 13 year old, right?" With preference for these two career tracks (industry vs. academia), it was therefore important for Ava to succeed in an academic setting since industry did not offer the flexible schedule she needed.

Sweet, who at the time was married with three children, also cited the need for flexible hours. She commented about the flexibility, it "was interesting to me and appealing to me." She added that her drive to succeed was also due to the benefits that would then be available to her children. Sweet said, "And then just thinking about myself, financially, my kids would be able to get some kind of educational benefits from the university, tuition waivers."

For other participants like Ann, it was the unique culture of academe that appealed to her and that contributed to her pressing on. Ann struggled particularly with aligning her personal ethnic/cultural value to those presented in her mainstream environment. If she had the opportunity to do it over again, Ann said, she "would've tried to look for someplace that had a better, more of a community feel." I asked Ann if she ever considered leaving her tenure-track position. She responded, "No. I was like they're gonna have to not tenure me if I'm gonna leave" (Ann).

Thus, what drove Ann? Ann had worked in industry previously and she desperately desired the intellectual autonomy offered to tenured professors. In reference to making tenure she said, "So there were parts that made me mad and parts that made me very happy so… on the whole, that was enough to make me say if I make it, then I'll have this autonomy that I want" (Ann). Having an underlying drive to succeed in the professoriate was not the only reason that the participants persisted, but it contributed to the diligence of many participants. Critical agency, career fit, and broader aspects of the professoriate in academe were three themes that emerged.

Up to this point I have reported on a handful of factors that served as strategies to facilitate the career advancement of the study participants. To review, five strategies have been mentioned thus far: (1) self-confidence (12 out of 13 participants), (2) self-efficacy (13 out of 13

participants), (3) personal agency (13 out of 13 participants), (4) a support system (13 out of 13 participants) and (5) an underlying drive to succeed in the professoriate (9 out of 13 participants). The first four foundational strategies were largely in place prior to the participants entering the professoriate and were present among all of the participants with varying levels of presence.

Next, I turn to reporting about how and why the remaining two external strategies—working in a supportive work-environment and professional socialization into the professoriate served as two key facilitators to promotion and tenure.

Two Key Facilitators to Promotion and Tenure

Professional socialization into the professoriate and working in a supportive departmental environment were two key external strategies that greatly facilitated the career advancement of participants. Just over a handful of participants had been professionally socialized into the professoriate. Those participants enjoyed a smoother time navigating the promotion and tenure process compared to the remaining participants who had not been socialized, as detailed below.

Also, many of the participants worked in a supportive departmental work-environment. Working in a supportive departmental work-environment was crucial because it enabled participants to establish themselves in a number of ways, also detailed below. For those participants who had been professionally socialized into the professoriate, working in a supportive departmental work-environment only catapulted their career advancement. For those participants who had *not* been professionally socialized, working in a supportive departmental work-environment was critical to their success.

Professional Socialization into the Professoriate

Six out of 13 participants were professionally socialized into the professoriate prior to entering the academy. Professional socialization made a significant positive impact in their

ability to navigate the promotion and tenure process. The six participants who were socialized into the professoriate were better prepared at the onset of their careers to assume their professional role and to charter challenging academic contexts. Specifically, these participants had an upfront understanding of the "system" of tenure, they understood the reward structures, and they were aware of common pitfalls to be avoided compared to those who were less socialized into the profession. As a result, these participants were able to mitigate many of the challenges presented earlier in this chapter, and sometimes circumvent them all together.

Suffice it to say that by the end of the probationary period, all participants had been indoctrinated into the professoriate; however, the focus here is on the six participants who were socialized into the professoriate through specific undergraduate, graduate, and post-doctoral experiences. Notably, there were different levels of socialization among this group of six. Three of the six participants were more strongly socialized into the professoriate than the remaining three. What was striking, however, was this entire group's understanding of the importance of having a well-developed research plan, a publication record in place, and a grant-getting agenda. Where the details differed was in their abilities to go about these activities strategically. Nonetheless there was an obvious difference in the 'know how' from the beginning for these six participants compared to the remaining seven participants, who were also undoubtedly successful. Below, I have provided two detailed examples from my data to illustrate the ways in which professional socialization into the professoriate facilitated one's career.

Jasmine, for example, entered her tenure-track position with a game plan. Jasmine stated this about her planning to get tenure, "I would say 85% of it was planned and the last 15%, I kind of bumped and stumbled through." What enabled Jasmine to plan was her understanding of what was important to get tenure and how to get it.

For instance, Jasmine demonstrated a strong understanding of mentoring and how that correlated with her promotion tenure packet review long before she got to the end of her six years. Recall that even though she had a number of mentors within her professional network upon her entering the professoriate, she still sought out a mentor in her department. Jasmine explained why: "I think I had a fundamental understanding of what a mentor was." She explained how she went about securing a department mentor: "I went and interviewed everybody in my department. I knew I needed a full professor and I went and interviewed them *all*…" Jasmine recalled her understanding of how mentoring was tied to her promotion:

> …at the end of the day, somebody's gonna have to speak on my behalf in the promotion and tenure process. Right? And so if nobody really knows me or understands what I was doing or why I'm doing it, then how can they really speak on my behalf?

Even though she considered her department chair a mentor, Jasmine explained why she nevertheless needed to seek out different departmental mentors at the time. Jasmine said:

> In the promotion and tenure process, he [chair] has to play another role and you can't necessarily rely on him to play both roles, nor should you. So by necessity, that sort of dictated having somebody else who could speak for me. Or speak on my behalf during that process. And so that's also, because that was my objective was to have somebody speak on my behalf, that limited me to my department.

Further, Jasmine knew that mentors from her 'outside' professional network were essential in many ways. Yet, she also knew that they were of little direct benefit in terms of her getting promoted within her department. Jasmine explained her understanding of why a departmental advocate was critical for a successful tenure decision, as illustrated below:

> I did have other mentors outside of my department. But there was really no benefit at this point for the purposes or trying to have someone…if I needed someone to speak for me, they needed to be from my department because there is no provision in our promotion and tenure process for somebody outside the department to speak up on your behalf.

Further, through socialization into the academy, Jasmine expressed that she received the message to avoid the pitfall of sacrificing her productivity due to service requests. She shared a piece of advice that was given to her by a Black female colleague. Jasmine recalled the words of her colleague:

> …you're gonna get lots of calls to serve because you're a Black woman. And the advice that I would give you is, every time you do one of those, you need to make sure you're putting a little bit of extra time in your research.

In fact, Jasmine was well aware of this upon entering her position, and did not find herself in a situation where she was overrun by service requests. Jasmine indicated that her socialization experiences stemmed from her graduate school and formative years. Specifically, it was her experiences connected to her Ph.D. advisor, her extended service in a professional disciplinary national organization, and her exposure to academic and industry leaders through her father's professional position in her field that made up her socialization experiences. Despite the fact that Jasmine was met with certain challenges during her probationary years, her professional socialization into the professoriate facilitated a smoother navigation with respect to service, strategic positioning of a departmental mentor, and generally knowing how to navigate the academic landscape.

Olivia was another participant who was socialized into the professoriate. Her undergraduate and graduate research experiences assisted in socializing her into an academic

research career. For example, hands-on experiences in her graduate school lab were particularly influential for Olivia. Olivia stated:

> I started noticing that I liked working with the undergraduates that were in my lab. And I had a couple of them that were my, as a graduate student, my advisor gave me undergraduate assistants. I liked working with the undergraduates. I liked teaching them and telling them what the research was all about and, you know, having them help me with the discovery process. I liked doing that as a graduate student and so I thought okay, then I guess I should do this as a professor.

As an early career faculty member, Olivia believed she was particularly effective in managing a productive laboratory and research group—a critical activity tied to keeping research operations flowing smoothly. Olivia credited her observation of, and interaction with, her undergraduate and Ph.D. advisors. She said, "I've noticed myself emulating some of the things that they, that I saw from them." "Like what?" I asked. Olivia said:

> Well, how to run a research group, or research meeting, for example. How to run a meeting when you're discussing the research and everybody's there and they're discussing the results that they have and how, you know, how to schedule, how to schedule them and, you know, the concept of presenting, you know, who presents every week and those kinds of things are, I think, are a direct product of what I saw from my own advisors.

Earlier, I reported about Olivia's ability to think ahead and to create action plans around setting up her laboratory and building her research plan. In part, her ability to know how to do so was due to her socialization into an academic research career. Olivia plotted her research plan before stepping foot into her first tenure-track position. Olivia said, "I sort of developed a plan,

an agenda for my research when I was preparing my research plan for applying to faculty positions." Her thorough understanding of the importance of having a research agenda, and how to go about it was evident in her comment. Olivia said, "I modified my research program so that I could start with things that were, that didn't require big equipment. I do a lot of research on [x] processes of [y] and that really just requires a bunch of beakers." Olivia demonstrated how she was positioned to succeed as a result of her being socialized into an academic research career:

> …when you prepare a research plan, as a potential faculty member, you have to think of these things. You have to think of the fact that when you arrive, you probably are not going to have the fancy schmancy $1 million piece of equipment that you are going to need eventually for this one particular project that you're excited about doing. You have to be flexible and plan to start… you have to assume you're gonna have nothing the first day you arrive.

Olivia was so indoctrinated and well prepared to enter a tenure-track position at a research university that it was difficult for her to understand how early career STEM professors could not take these unforeseen events into account when planning their research activities. Olivia said:

> I think, honestly, I think a lot of assistant professors that show up and they have no clue about this. I don't understand how they cannot know that you should actually prepare a research plan that takes into consideration all these contingencies.

Beyond research experience as an undergraduate and graduate student, Olivia placed into two competitive fellowship programs as a doctoral student that targeted developing future faculty cohorts. One in particular focused on teaching in a research university setting. In addition to developing her practical teaching and classroom management skills, the teaching fellowship also

taught her about academic culture, teaching philosophy, and about applying to faculty positions. Olivia said:

> We did have to do the teaching statement as part of that program. So actually, when I was in graduate school, I already more or less had that finished before I graduated, before I even applied to positions or before I started thinking about applying to positions. Just because of that experience.

Further, Olivia participated in a number of workshops that targeted developing future faculty; she was also heavily involved in a professional disciplinary national organization. Despite some of the challenges that Olivia faced, she was able to navigate the promotion and tenure process relatively smoothly due much to her prior preparation.

In contrast, Destiny, who was *not* socialized into the professoriate, commented about her entering the professoriate, "I didn't know that much about academia when I got into it…" Destiny explained:

> The research world was very, very different so in a sense, I naively went into that. I knew I loved, I loved science. That wasn't an issue. But I didn't know what all the rules were and that's…I think that's an issue for a lot of new people. They don't know what the rules are. And nobody necessarily tells you what the rules are…. if you don't know the rules of the game, it's hard to play the game.

Avignon was also less socialized into the professoriate. After her schooling abroad, she worked in industry for a few years before turning to her first tenure-track position. Even though Avignon was tenacious and self-driven, the facilitation of her process was less smooth, particularly over the first two years of her career. Avignon said:

> I had no idea... I wasn't sure if I was doing the right thing because the problem was I didn't, I never had experience working in an American academic institution…so I had no model of how to do this thing or what it takes to survive in this highly competitive environment.

What resulted was lost time in her productivity and a threat to her making tenure. Avignon explained:

> So for the first two years, I was just, I was working really hard but it was, my efforts were not directed in the right way. After that, when it looked as though I was gonna be in trouble, and that I may not make tenure, you know, because I basically screwed up, you know, my first two years…

The vague promotion and tenure expectations did not help Avignon's situation, nor did the poor collegiality and climate in her department at the time. Fortunately for Avignon, her department underwent a major shift in structural and leadership re-organization that resulted in her receiving much need mentoring and guidance. However, she realized the cost associated with her first two years of misdirected efforts. Avignon said:

> …and it was clear from that, you know, information that I was wasting my time. I was investing too much in the people around me and wasn't expecting enough from my students. That you know, the effort was flowing away from me and not enough was coming towards me. And that, that balance had to change and I really struggled with that.

Given that she was approaching half-way through her probationary years, Avignon was stressed and very much pressed for time in ways that were not necessarily true for those who had been socialized into this profession. Also, recall that Avignon struggled to align her personal

ethnic/cultural values with those of her mainstream environment, in addition to experiencing separation from her partner. These challenges resulted in a pronounced need for Avignon to rely on her personal support network, her "cultural values to stay strong" (Avignon), and the need to start seeing a therapist in order to cope with the immense pressure.

Another participant, Ann, was also initially less prepared to assume a career in the professoriate. In response to my question inquiring about her understanding of what it meant to be a faculty member, Ann replied, "…I got pretty much thrown right into it… I was pretty naïve." Ann struggled particularly with developing a research agenda.

In contrast to Jasmine and Olivia, Ann expressed that her research activities were not cohesive and that she struggled to develop a research agenda. Ann said, "I worked on [x], I worked on [y], and I worked on [z]. The common theme was I was looking [a] but I was also not…I didn't have this, the strategy laid out so I could leverage my projects all together." Although Ann made tenure, she was unable to develop a strong research agenda over her probationary years—"I was never able to do it over my assistant professor years," said Ann. Further, recall that Ann 'barely' made tenure because of her minimal publications.

For Ann, her minimal publication record was tied to having an underdeveloped research agenda. Her underdeveloped research agenda was related to the fact that she did not have a research plan strategy in place. In turn, she did not have a research strategy in place because she had not been fully professionally socialized to embark in an academic tenure-track position at a research university. Although Ann was excellent at securing external grants and confidently navigated a male dominated engineering environment time and time again, she experienced a bumpier road to tenure primarily because of challenges related to her research and publication agenda. For the participants who were less familiar with the career aspects of academe and the

professoriate, their ability to navigate the promotion and tenure process was less smooth but still successful. In contrast, the participants who were socialized into the professoriate demonstrated a greater understanding of the tenure system, its reward structures, and how to navigate around common challenges.

I also observed that the professionally socialized participants typically had a wider developed professional support system in place at the beginning of their careers. As previously discussed, this fostered their ability to address a wider set of obstacles with greater expedition due to the availability of emotional, psychological, and cultural support from their personal support systems, *as well as* disciplinary specific and professional advice when needed. Also previously discussed, these participants were further able to diminish or avoid many of the obstacles presented earlier in this chapter and were able to navigate the academic landscape with greater ease. For these reasons my findings indicate that professional socialization into the professoriate was a distinct feature, that if present at the onset of one's career, produced a division in footing with respect to navigating the promotion and tenure process.

Supportive Departmental Work-Environment

Ten out of 13 participants attributed their tenure success to their individual efforts, in conjunction with their supportive departmental work-environments. There were three key work-environment aspects that the participants cited. The first was working in a collegial setting, the second involved dynamics with the department chair, and the third was starting off with a quality start-up package. Typically, the greater the number and level of presence of these aspects in a participants' work-environment (e.g., a strong level of collegiality, strong positive relationship with chair, and a quality start-up package), the greater level of support each person felt and the stronger start each participant experienced as they entered their career. In contrast, those who

worked in a department with a lower number and presence of these three work-environment aspects (e.g., a mediocre level of collegiality and a sub-par start-up package), the less supported the participants felt and the more challenging context they navigated.

Collegiality. Working in a collegial environment fostered an enjoyable place to work for many of the participants, one where individuals felt respected and where morale was up. It was a "healthy environment," said Engineering of her small department. Collegiality was especially critical for early career faculty who had not been professionally socialized into the professoriate.

One participant said that in the end, what enabled her tenure was her own effort in partnership with her supportive department. Avignon said, "I think the two important intersecting factors were, I decided that I wanted tenure and the department decided that they wanted me to get tenure." Avignon was a participant who was less socialized into the professoriate prior to taking her first tenure-track position. Avignon believed that without her department's support, her determination alone would not have sufficed.

In reference to her departmental colleagues' support, Avignon said, "If getting out of that hole was going to be solely due to my efforts, I don't think I would've made it. The help that I got was just too practical and important." Recall that Avignon had misdirected her effort in her first two years because she was not familiar with the academic landscape, nor was she fully prepared to assume a faculty role. It was her departmental colleagues who pulled her aside, mentored her, and helped her to get 'out of the hole'. She concluded, "that put me over the top" (Avignon). Working in a supportive departmental work-environment was particularly critical to her success.

Apart from her own effort, Ava's departmental support was also particularly critical in her tenure because she was less familiar with the expectations of a tenure-track career at a

research university. In fact, Ava stated that her ability to make tenure "was partly departmental." Ava expressed that her department environment was extremely supportive when she said: "…when I asked for help or asked for advice or something, I got it." Ava described her department culture this way, "people said 'as long as we see you trying to succeed in any small way that we can, we're gonna help you do that'." Now, "I mean, that wasn't always perfect" said Ava, but also, "there was nobody out to put big boulders in the way" (Ava) she recalled. Ava described the welcoming feel of her department:

> …it was more like, 'we think you're supposed to be here and we're gonna help you', rather than 'we are mad as hell that you're here and we're going to do everything we can to make you leave as soon as you can'. (Ava)

Ava recalled that her colleagues helped to support her, in particular, with getting a handle on grant writing. Ava stated, "I didn't have any post-doctoral experience…I had *no* experience in writing grants." Provided this critical activity for STEM faculty, Ava was thankful for the helpful members of her department. Ava said, "So, but one thing that was good is that I was in a smaller department…it felt then and it seems to me now that people wanted me there." Ava's colleagues offered her help as she learned the ropes of grant writing.

Destiny was another participant who credited her collegial environment, in part, to her tenure success. Like Avignon and Ava, she relied heavily on the department's collegial culture to facilitate the early part of her faculty career because she had not been professionally socialized to assume an academic tenure-track position at a research university. In particular, Destiny was at a loss with developing a research agenda of her own, but her departmental colleagues were very helpful in assisting her to do this.

Destiny said, "it was collegial in that people had conversations with me." She provided an example of the collegiality she experienced when she said: "…they were very welcoming into the lab and would give me little pieces of what they were doing so I could learn some things. So, it wasn't an organized effort but people were very helpful." However, Destiny made sure to note that they "didn't always get along in terms of who thought who was doing what." Nevertheless, the assistance from her colleagues who gave her 'little pieces' of what they were doing and who welcomed Destiny into their labs was critical to her success.

For other participants, such as Beyonce, her collegial setting left her with a positive feeling of support as she underwent the promotion and tenure process. Beyonce said, "quite honestly, all I remember is that it was a very positive kind of experience while I was there. I really felt like the department, the individuals in the department were invested in my getting promoted and tenured."

For participants who *were* professionally socialized into the professoriate, working in a collegial setting only furthered their success because it made the participants feel respected and welcomed. For example, Olivia commented that she was "treated *very* well in the department" (Olivia). The strong level of collegiality in her department led Olivia to feel "very, very considered and very much a part of the team" (Olivia). That was important to Olivia because it made her feel well received and that her opinion counted.

Department chair. Several participants cited either having a productive and positive relationship with their department chairs, or noted their chairs' leadership efforts in creating a positive work-environment.

One participant gave much credit to her department chair for her success because he played an important role in protecting her from service. As a token woman of color female in

her department, Sweet was a target for service requests. Sweet said, "And so he brought down a lot of barriers for me and got people to leave me alone so I could do what I needed to do so I owe a lot to him in terms of my ability to make tenure." Her chair also played a role in her success because he actively connected Sweet with critical mentors and connected her to campus resources. Sweet explained how having a positive and productive relationship with her department chair impacted her career:

> You know, he had helped me with finding a mentor and giving me resources. The first year I was here, for instance, I did my dissertation and then that summer, I worked on my first National Science Foundation grant and I'd never wrote a grant before in my life. And he had our dean for research, you know, looking over drafts and so forth. And I got the career award for the first research proposal I ever wrote in my life.

Another participant spoke fondly of her department chair. Maria stated that her chair was in a different disciplinary area and therefore, "wasn't able to help [Maria] get established in the field." However, Maria nevertheless very much appreciated her chair's leadership and the supportive departmental environment that her chair created. Maria explained, "she made an effort to provide some opportunities for mentoring in terms of meeting with her and other junior faculty, like informal coffee hour sort of thing. So that was something there that she did for all of the junior faculty" (Maria).

Maria also talked about other ways that her chair created a positive work-climate, such as her chair's hiring initiative. Maria explained that her former chair "recruited one, two, three, four (pause) four faculty and three of the four faculty were women" (Maria). In fact, Maria said, "at one point our department, I think, out of 10 faculty was like eight women." Even after those numbers dropped, Maria was especially appreciative of working in an inclusive work-

environment. "So it was really unusual that there were so many women in our department. It was great," said Maria.

For at least one participant, the entire challenge of having to navigate through vague promotion and tenure requirements was avoided because her chair was transparent and forthright. Jasmine shared, "So well, my department head definitely sat down with me and talked extensively about expectations…that was always clearly laid out for me" (Jasmine).

In Olivia's case, she explained why she was especially appreciative to have had a positive and productive relationship with her chair and why this work-environment aspect was an important factor to make tenure in general. Olivia said:

> So you know, the bottom line here, the message here is that some of it, unfortunately, depends on your relationship with the chair of your department. Because they're the ones that are going to be making the case for you. And if they're not excited, they're not gonna make a good case for you. (Olivia)

Apart from collegiality and a dynamics related to the department chair, a third key element, a quality start-up package, was also cited as a work-environment aspect that contributed to the participants' successful career advancement.

Start-up package. Starting off with a quality start-up package was an important factor that played a role in the career advancement of many participants. Specifically, start-up research funds, a reasonable or choice course assignment(s)/load, and access to immediate lab space and equipment facilitated the participants' success. Any number of items made up a start-up package, and no two were alike. The following items were mentioned by the participants: base salary, start-up funds for research activities, lab space, equipment, course load/assignments, release time agreements, and supplemental activity funds (e.g., a technician, books, technology

needs etc.). Apart from the start-up package itself, the initial engagement of how the negotiation process came together mattered for the participants because it set the tone. Since many participants were satisfied with their initial offer, there was little need for many of the participants to negotiate.

One participant commented about her start-up package and the negotiation process, "No, I don't think anything was difficult. I think it was, it was actually a really positive experience" (Beyonce). A second participant, Maria, explained that her negotiation process went pretty smoothly, and that she felt supported from the start because she was given the necessary tools she needed to succeed. Maria said:

> …the startup negotiation I thought was very transparent, was very straightforward. You know, the chair was trying to make sure that each individual faculty had all the necessary resources to be able to establish their career at [university], and so it wasn't ever, or at least it didn't feel to me like it was trying to extract water from a rock or something like that. Seemed very generous and the expectation, or the ultimate goal was to make sure that each individual had the necessary resources for their program. So it didn't, it didn't, it actually went pretty well.

The process was not perfect, however, because Maria had to grapple with "administrative bureaucracy" (Maria) in terms of wait time to access her lab, but it was because her laboratory was getting renovated. Maria stated that when she received an eight-person laboratory, she was quite pleased. Maria continued, "it had to be renovated to my specifications so that part was, was great." Her department was very helpful in that "they worked with a person on campus to deal with the renovations" (Maria). As far as Maria was concerned "all of that part was fine"; however, Maria stated that "the limitation was the time to actually get the work done." The

promised six-month renovation turned out to be 1.5 years. Maria's department, however, provided her with a temporary lab space in the interim. Despite the wait time for her laboratory renovations, Maria felt satisfied regarding her access to proper laboratory space and to the basic equipment necessary to get her research activities going soon after her arrival. For most of the participants, the immediate availability of proper laboratory space was available, but not perfect.

Avignon was also pleased with her start-up package. She said, "There were no difficulties in that area. At that time, the department had money and the start-up packages for all of us hired at that time was fairly similar." However, like Maria, the process was not perfect for Avignon. In her case, it was a matter of equipment. Avignon stated, "We inherited different space with different equipment. I did not inherit a lot of equipment. So that was a problem." Although Avignon was able to purchase the equipment necessary for her laboratory *because* she received a quality start-up package, Avignon referred to this as a problem because another colleague inherited a space with "excellent equipment." Thus, she viewed this as a disadvantage because "he did not have to spend his money, his startup package, you know, buying certain things," said Avignon. Overall, however, she reported being satisfied with her start-up package.

Another participant, Sally, was also assigned immediate laboratory space and received a main piece of equipment that she needed for her research. Sally said, "the department was willing to buy the instrument that I needed" which cost "$600,000." Sally recounted the details of her start-up package and expressed her satisfaction when she said:

> I need more than half a million dollars for a piece of equipment, they're gonna pay me the first two years summer salary, they're gonna pay for a student for a year, and they wanta hire and pay for a technician. That sounded really good.

However, the start-up details were not perfect for Sally either. Sally's challenge was more severe than Maria or Avignon's because she had to build her lab "from scratch" (Sally). Sally clarified:

> When I say build, I mean the room I was in was, had been a storage room. It was full of junk so that had to be cleaned out, the floor had to be put in, ceiling tiles. I had to order chemicals. I had to order a big piece of equipment. You know, it was literally building a lab from scratch.

This turned out to be a major disadvantage because it cost her time, but Sally persevered. Beyond this, initial course assignments and assignment loads were other areas of importance and satisfaction for many participants. For example, Isabel received a course "release from the first semester" (Isabel). Isabel commented: "that's a very helpful thing because when you start a position, I mean, you are totally bombarded with information." Isabel also mentioned that her initial course release helped to reduce her stress level. Several participants appreciated release time or a reduced teaching load in their first year.

Beyonce was satisfied with her course load and assignments for a slightly different reason. She explained that her course assignments were reasonable and less stressful because they were based on her dissertation research area. Beyonce said, "the courses that I taught were based on the research that I had done so …that [was] no big deal…. Most of the time, I was teaching sophomores and juniors." The fact that she was also encouraged to contribute to the curriculum further satisfied Beyonce because it offered an element of creativity and fun. She said, "I was encouraged" to contribute. Beyonce said, "I suggested a special study course, I was allowed to develop that and to teach it over the summer and that was a lot of fun" (Beyonce).

Working within a supportive departmental environment facilitated the successful career advancement of many participants. In particular, it was aspects of working in a collegial setting, the role of the department chair, and starting with a quality start-up package that created important supportive environments for the participants. Though not every one of these elements was perfect, overall most of the participants attributed their successful career advancement to their own effort combined with a supportive departmental work-environment. Next, I present a summary of the challenges and strategies reported throughout this chapter.

Summary of Findings: Challenges and Strategies

My primary research question was: *What contributes to the successful career advancement of women of color faculty in the fields of academic science, technology, engineering, and math?* To address my main research question I explored two sub-questions: a) What strategies did tenured Hispanic/Latina and Black women faculty in STEM enlist to successfully overcome personal, organizational, and disciplinary related challenges amidst the early career promotion and tenure process? and b) What factors enabled them to persist through these challenges? There were five primary challenges encountered by the participants in this study. The following table **(Table 4)** summarizes the challenges, sub-themes, and issues that made up these categories.

There were seven factors, or strategies, that enabled the participants to persist through these challenges as they persevered to tenure. Four were "foundational strategies," or strategies that were utilized by all of the participants; these strategies made-up the foundation of the participants' successful career advancement. They are as follows: (1) self-confidence; (2) self-efficacy; (3) personal agency; and (4) a support system. The four foundational strategies were largely in place for each individual *prior* to the time the participant entered the professoriate.

FIVE KEY CHALLENGES
for
BLACK AND HISPANIC/LATINA WOMEN, EARLY-CAREER STEM FACULTY

1. Vague Promotion and Tenure Expectations:
- conflicting information
- undefined expectations
- unwritten rules regarding value of activities
- lack of firm quantity markers, especially for publication and grant dollars

2. Grant and Publishing Pressure:
- Difficulties related to both grant and publishing pressure (sub-theme)
  - lack of quantity markers to make promotion and tenure
  - "as much as you can" mentality = stress/anxiety
  - disruption or imbalance of semi-dependency of securing grants to publication output
  - writing
- Grant specific difficulties (sub-theme)
  - disciplinary culture - reduced prestige/reduced value of research if no grants or difficulty to secure them, increases individual pressure
  - increased competition in a tight fiscal era
  - navigating funding agencies
- Publication specific aspects (sub-theme)
  - not only to publish, but *where* to publish/weighted value and esteem or lack thereof

3. Work-life Difficulties:
- Impact on relationships (sub-theme)
  - geographic distance
  - limited professional opportunities for partners
  - long work hours
- Hispanic/Latina cultural work-life tensions (sub-theme)
  - family first
  - pressure/expectation to have children
  - traditional domestic gender roles
  - language, acculturation to US culture, appease authority
- Hispanic/Latina mothers on the tenure-track (sub-theme)
  - primary care giving and domestic responsibilities
  - pressure to perform with excellence in personal and professional spheres
  - exacerbated stress for mothers after childbirth if inadequate maternity policies exist
  - concern to enter motherhood while on the tenure-track impedes family formation

4. Navigating a Gendered and Racialized Academic Landscape:
- Development of race/gender salience at predominately White research universities(sub-theme)
- Subtle or background stress related to racial/gendered incidences (sub-theme)
- Personal ethnic/cultural discord with predominately White/patriarchal institutional culture (sub-theme)

5. Service:
- Disproportionate university service requests (sub-theme)
- Internal sense of obligation to serve, especially to student community (sub-theme)

Table 4. Five Key Challenges for Black and Hispanic/Latina Early Career STEM faculty: Key challenges are numbered/in bold. Solid circle bullets are sub-themes, also designated in parenthesis. Open-circle bullets are the issues that make up a main theme or a sub-theme.

There were also three additional strategies that were utilized by some of the participants, but not all. These strategies are termed, "variable strategies." The remaining fifth, sixth, and seventh variable strategies were: (5) an underlying drive to succeed in the professoriate; (6) professional socialization into the professoriate; and (7) working in a supportive departmental work-environment.

These seven strategies were assembled in different ways for each participant to form their individual strategies of success. Further, there was variation in the level of *strength* that any one of the seven strategies was present. That is, each of the seven factors varied in intensity from "low" to "high" for each person.

For example, one individual may have had a vastly expanded personal and professional support system, while another individual may only have had two key individuals that they relied on for personal or professional support. Finally, two of the variable strategies—professional socialization into the professoriate, and working in a supportive departmental work-environment—greatly facilitated the participants' ability to navigate the promotion and tenure process, and to advance their academic careers.

The figure below **(Figure 7)** depicts the seven factors, or strategies, that enabled the participants to persist through a number of issues and challenges as they successfully navigated the promotion and tenure process from assistant to associate rank status. The bottom row represents the four strategies that formed the foundation of all of the participants' success. The three circles represent the strategies that varied among the participants. The "intensity" of each strategy is indicated from low to high on the left-hand side.

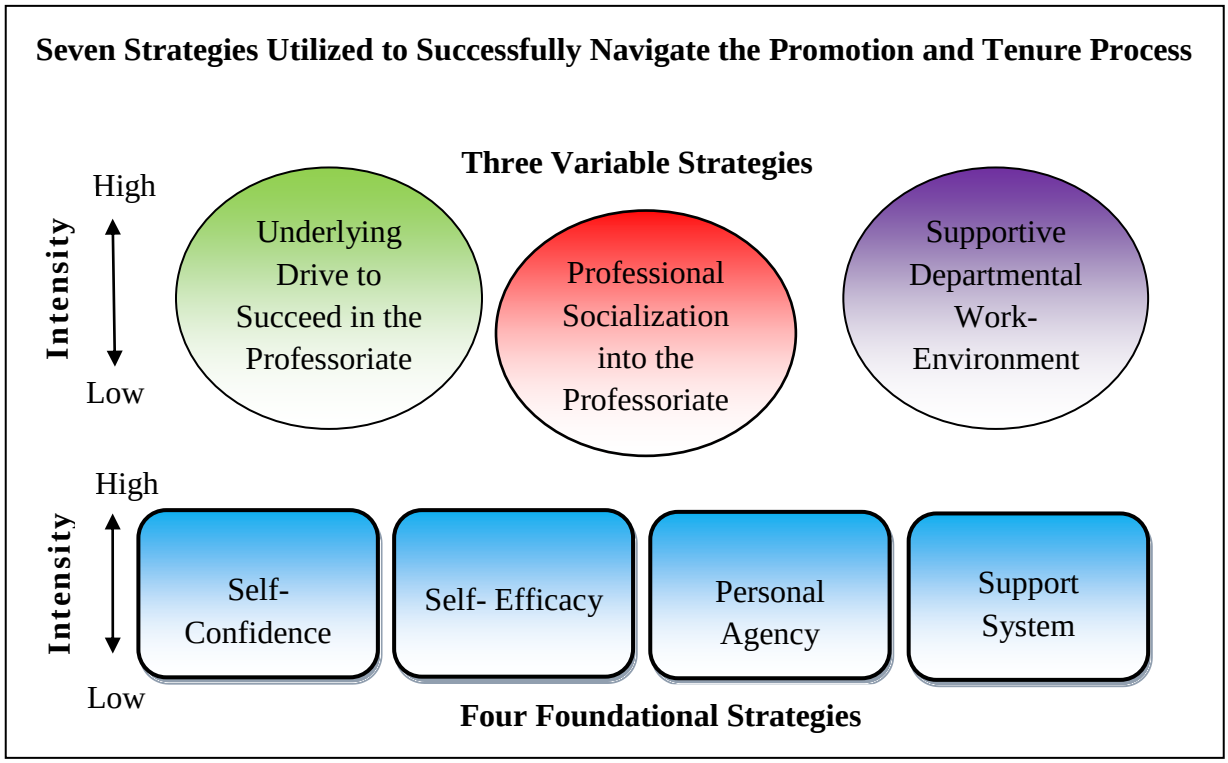

Figure 7: Seven Strategies Utilized to Successfully Navigate the Promotion and Tenure Process: For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this dissertation.

For illustrative purposes, the following three figures **(Figures 8-10)** depict three common profiles that made up the success strategies for the participants in this study. The four foundational strategies that made up the backbone of all of the participants' success are located at the base of each of the figures. The circles above the foundational strategies represent three strategies that varied among the participants (i.e., not *all* of the participants shared these strategies). In the figure below **(Figure 8)** all seven strategies are present with a high level of intensity. A participant with this profile typically experienced a smoother path to tenure.

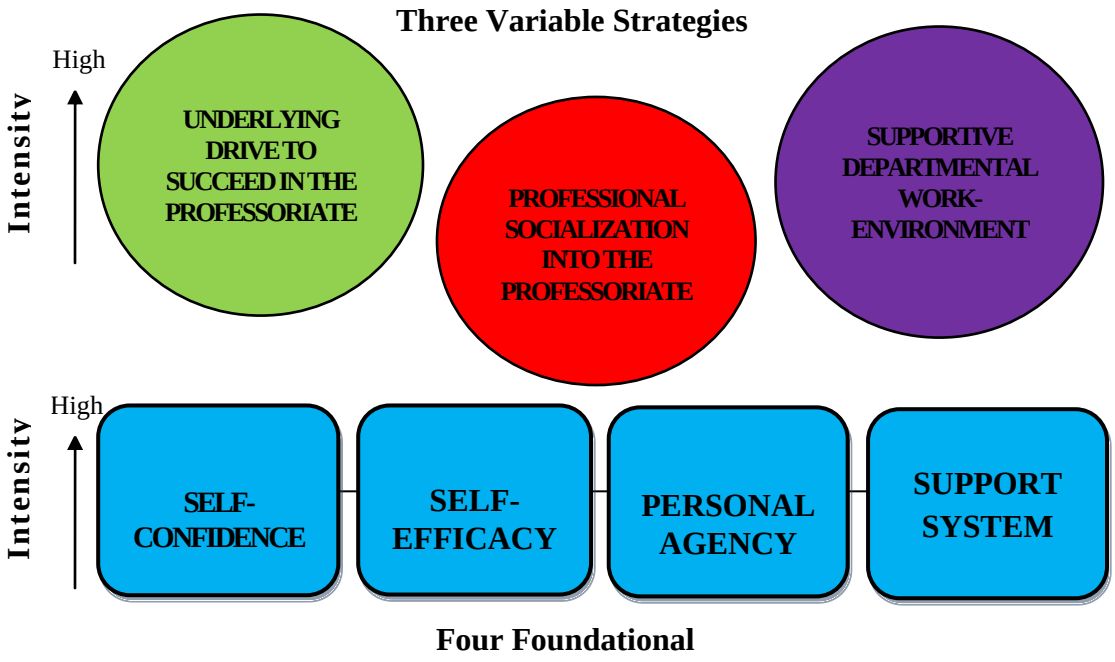

Figure 8. Success Strategy Profile One: A solid color with bolded/capped lettering indicates a strong presence of a strategy. The base row contains the four strategies that made up the foundation of all of the participants success. The top circular row contains the strategies that were present for some, but not all. In this profile, all seven strategies identified in this study are present, and with a high intensity.

One participant who exemplified profile one was Jasmine. Jasmine had a strong level of *all* foundational and *all* variable strategies present as a probationary faculty member. She spoke about how she was instilled with self-confidence over her childhood and formative years, in part due to her father's message that she could always 'come home'. Jasmine's confidence played a central role in her ability to manage a particularly unruly classroom environment. Also, despite Jasmine's initial difficulty to secure external funding to support her research, she expressed a strong sense of self-efficacy to 'be the one' who could receive grant dollars to answer that research question. Her strong sense of self-efficacy regarding her ability to secure external funding is, in part, why she persisted through this obstacle and continued to take action, to write,

and to re-submit (e.g., personal agency) even after seven or eight proposal attempts. As previously noted, Jasmine also had an extensive personal and professional support system.

Further, although Jasmine had initially considered entering industry after the completion of her Ph.D., she felt compelled to take the opportunity to join the professoriate because she desired "to go back to [her] alma mater and teach" (Jasmine). This, combined with her enjoyment of teaching and research, contributed to her underlying drive to succeed. As previously noted, Jasmine was strongly professionally socialized into the professoriate through guidance from her major advisor, through engagement in professional opportunities as a graduate student within a disciplinary-based, professional national organization, and by interacting with a number of industry and academic leaders growing-up.

Finally, Jasmine talked about working in a very supportive departmental work environment. She was the only participant who asserted that vague promotion and tenure requirements were not an issue that she faced. Jasmine's chair had an extensive conversation with her and informed her of the expectations needed to make tenure, including the amount of funding she was expected to bring in. For these reasons, Jasmine provides a good example of profile one.

In the figure below **(Figure 9)** the base row contains the four strategies that made up the foundation of all the participants' success. The top circular row contains the strategies that were present for some, but not all participants. In this study, if participants were not professionally socialized into the professoriate, a key to success was the presence of a strong supportive departmental work-environment, along with utilizing the four foundational strategies. The image below depicts varying strengths among the six strategies, and the absence of one strategy (e.g., professional socialization).

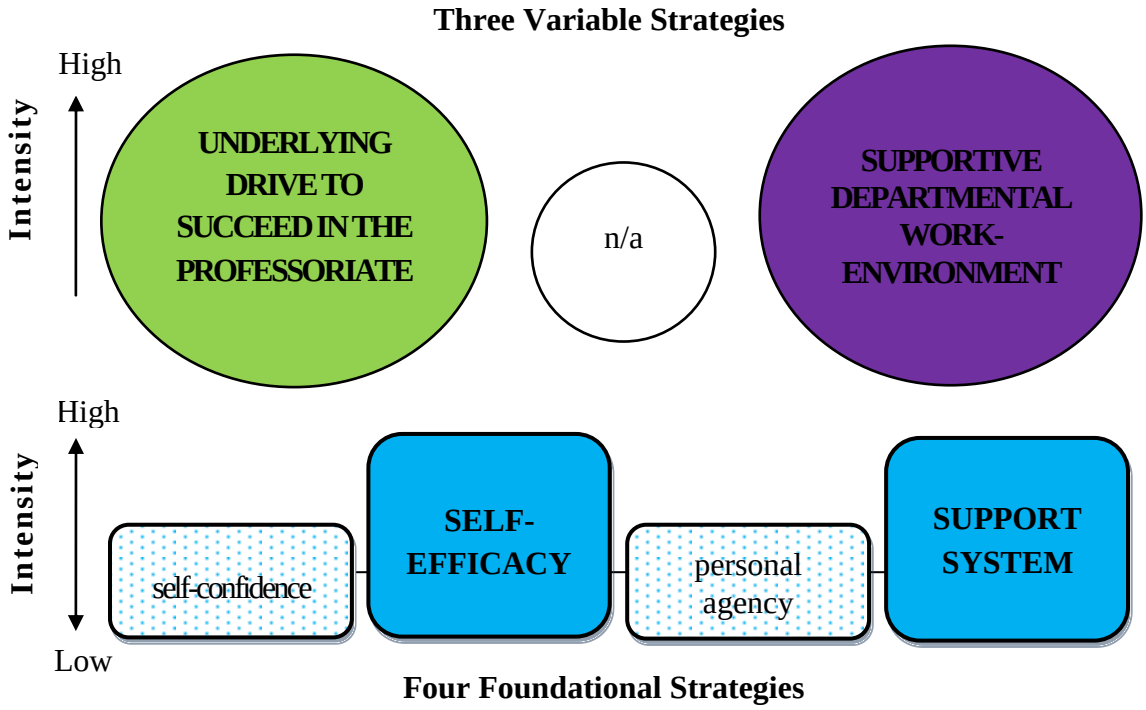

Figure 9. Success Strategy Profile Two: A solid color with bolded/capped letters indicates the presence of a strategy with high intensity. Strategies not available are depicted as "n/a". Strategies that are present with a softer/weaker level of intensity are dotted with lower-case and non-bolded letters. In this profile, the four foundational strategies are present with high *and* low intensity. Two out of three variable strategies are present and they are high in intensity.

An individual with a profile depicted in figure nine above often struggled to get her footing initially but approximately half-way through their probationary period, typically gained a handle on what was needed to secure tenure. Avignon was one participant who fit this profile. As previously discussed, she had not been professionally socialized into the professoriate. As a result, she found that much of her early efforts 'flowed away' from her. Additionally, while Avignon possessed self-confidence and personal agency, she asserted that she felt less certain about the intensity and presence of these two factors. Yet, Avignon spoke about two elements that played a strong role in her persistence (e.g., an underlying drive to succeed in the professoriate, critical agency).

The first was connected to a childhood dream to make an impact in science and education, one where Avignon still believed in her 'future self'. The second included aspects of critical agency. Although Avignon did not initially feel supported by her department, a re-organization in the department's structure and leadership produced a palpable difference in the culture, mentoring, collegiality, and support that she felt from her department by her third year. Ultimately, Avignon gave much credit to the support she received by her departmental colleagues in helping her to 'to get out of the hole', and in her ability to make tenure.

Further, Avignon possessed a strong sense of self-efficacy in relation to teaching and mentoring students. Finally, Avignon had a very strong support system in place and relied on this system to persevere through a number of challenges. Specifically, Avignon had a strong network of professional mentors outside of her departmental setting. She also had a strong personal support system that included her family and peer colleagues at her institution with whom she shared a similar racial and ethnic background. Avignon provides a fitting example of profile two.

The figure below **(Figure 10)** depicts the third, but least prominent of the common profiles represented in this study. If participants did not work in a supportive departmental work-environment and were also *not* professionally socialized into the professoriate, the key to success rested on the four foundational strategies (bottom row), even if the presence of these four strategies was not fully robust, as illustrated in this third profile. Typically, however, this profile was in concert with the strong presence of one other factor. A participant with this profile typically wrestled more with the number of challenges encountered amidst the tenure-track throughout their probationary years.

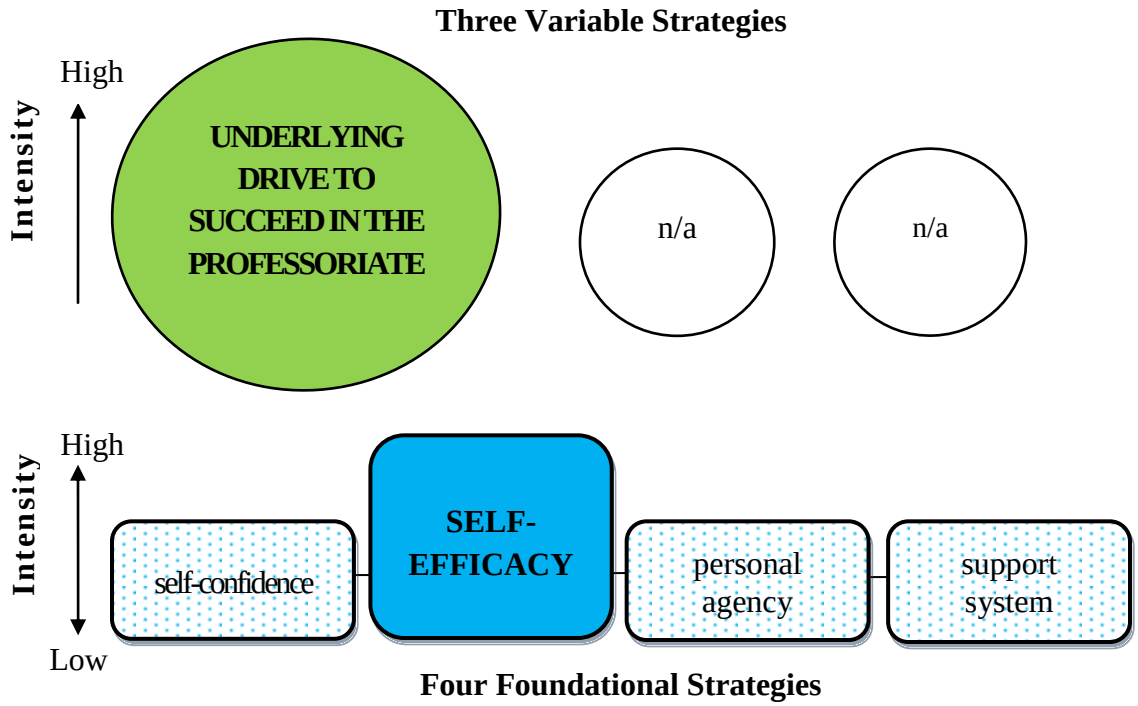

Figure 10. Success Strategy Profile Three: A solid color with bolded/capped letters indicates the presence of a strategy with high intensity. Strategies not available are depicted as "n/a". Strategies that are available with a softer/weaker level of intensity are dotted with lower-case and non-bolded letters. In this profile, the four foundational strategies are present with primarily low intensity. Only one variable strategy is present with high intensity.

Ann provided an example of profile three. Ann felt very passionate about attaining intellectual autonomy (e.g., underlying drive to succeed). This strategy, along with the four foundational strategies, played an important role in Ann's ability to successfully advance her career. On average, the four foundational strategies shown in profile three are present at a lower intensity compared to profiles one and two above. Despite Ann's success, she was unable to fully resolve many of the challenges and obstacles that she was met with as a junior faculty member.

For example, Ann consistently struggled to develop a strong research agenda and, in her own words, 'barely' made tenure because she was unable to produce a robust level of publications. In part, this was due to her lack of professional socialization into the professoriate. But also, she had not acquired proper laboratory space or started her tenure-track position with a quality start-up package. Ann remarked that she was 'pretty naïve' when she entered her first tenure-track position, and that she did not fully understand the evaluative weight of research and publications to make tenure. To complicate matters, Ann worked in a department environment that was not optimally supportive. For example, she was constantly sought to fulfill diversity service requests, she was consistently assigned to teach disproportionately high course loads compared to her departmental colleagues, and the chair of her department did not support Ann during a critical life transition (e.g., she was required to return to teach just four weeks after giving birth with her 'son in a sling').

While Ann utilized the strategies available to her, there were a variety of issues, including: a lack of mentors; a very basic personal support system; a minimal supportive departmental work-environment; a lowered sense of agency; and no professional socialization into the professoriate prior to the beginning of her career. Ann said that she did not know how to advocate for herself, nor was she able to get the mentoring, support, or training she needed to develop a strong research plan during her probationary years. However, Ann possessed a strong sense of self-efficacy, particularly in relation to grant writing and with navigating a patriarchal, disciplinary work-environment. In addition, gaining intellectual autonomy was a fundamental force driving Ann's desire to succeed. For these reasons, Ann provides an example of profile three.

In this results chapter, I reported the findings of my primary research question based on the responses of 13 faculty participants. I began this chapter with an overview of the study participant and institutional profiles. Second, I split the results into two sections. The first section presented the five challenges reported by the participants. The second section presented the seven strategies that contributed to the participants' success. I concluded chapter four with a summary of results. The final chapter, "Discussion," is next.

CHAPTER 5: DISCUSSION

In this final chapter, I present the following information: (1) an overview of this study; (2) summary of key findings; (3) conceptual framework and study design usefulness and limitations; (4) discussion of results; (5) implications for practice; and (6) suggestions for further research.

Overview of Study

Study Rationale

At the national level, Black and Hispanic/Latina women are increasingly recognized as key sources of underutilized talent that may fulfill part of a larger strategy to build the nation's STEM talent pool (CEOSE, 2011). One result of this acknowledgment has been the funding of initiatives by the federal government, non-profit organizations, and higher education institutions over the last decade to support and advance the careers of women of color in academic STEM fields (NSF, n.d.; AAC&U, 2012, para. 1). Yet, this demographic group remains underrepresented as members of the professoriate in the STEM fields (Nelson & Brammer, 2010; Towns, 2010). Of concern is that the current literature reflects a notable absence of information regarding the successful academic career paths of early career Black women and Hispanic/Latina faculty who are in the STEM fields (Ong et al., 2010).

The early career literature does, however, thoroughly document the *challenges* commonly faced by all early career faculty (Gappa et al., 2007; Trower, 2005; Sorcinelli & Yun, 2007). The issue here is that this body of literature largely falls short regarding the close examination of challenges that may differentially affect early career faculty of color. The faculty of color literature, in turn, focuses closely on issues that may differentially affect faculty of color but does not thoroughly differentiate issues (and in some cases, strategies) according to faculty rank, disciplinary area, gender, or institution type (Cooper & Stevens, 2002; Turner, Gonzalez, &

Wood, 2008). This makes it difficult to tease out what issues or strategies are most relevant for early career Black and Hispanic/Latina faculty in STEM.

In addition, the small sub-set of literature that focuses on women of color faculty often does not make distinctions between women of color and their particular experiences (Jean-Marie & Lloyd-Jones, 2011; Johnson, 2011; Ong, 2005). This leads to a false sense of shared homogenous experiences for and about women of color faculty. Further, what body of literature exists on the faculty careers of women of color in STEM lacks in-depth qualitative analysis (Ong et al., 2010).

Research that has been conducted thus far in the bodies of work mentioned above are undoubtedly useful; however, it is possible that if research efforts do not consistently investigate what factors contribute to the successful rank advancement of this demographic group, a larger US strategy to include Black women and Hispanic/Latinas in the STEM fields may remain a challenge where the academy is concerned. Despite the shortcomings of this knowledge base, resource allocations and the development of programs and initiatives to support the successful career advancement of women of color STEM faculty continue to proceed with little empirical foundation.

Much remains to be learned regarding the particular challenges faced by Black women and Hispanic/Latina STEM junior faculty as they seek to achieve promotion and tenure from assistant to associate rank at predominately White, research universities. Likewise, much remains to be examined regarding how those who have been successful strategize to overcome the challenges they face as they pursue tenure. For these reasons, this research study is important because it contributes, however modestly, to a much needed set of empirically grounded

recommendations to support the academic career advancement of STEM women of color in the professoriate. Next, I briefly provide an overview of the research question followed by methods.

Research Question

In this study, I examined the factors that contributed to the successful promotion and tenure of Black women and Hispanic/Latina STEM faculty from assistant to associate rank status at predominately White, research universities. This study was driven by the following main research question and two sub-questions: *What contributes to the successful career advancement of women of color faculty in the fields of academic science, technology, engineering, and math?* My sub-questions were: a) What strategies did tenured Hispanic/Latina and Black women faculty in STEM enlist to successfully overcome personal, organizational, and disciplinary related challenges amidst the early career promotion and tenure process?; and b) What factors enabled them to persist through these challenges?

Methods

This was a qualitative study based on 13 Black women and Hispanic/Latina STEM faculty who successfully advanced rank from assistant to associate status at predominately White, research universities (RU/VH and RU/H). The participants were accessed through a purposeful snowball and network sampling technique over an intense recruitment period of three-and-a-half to four months in 2013. During this time, an email with a project description and a study summary was sent to a number of list serves, professional associations, and professional contacts. Those who fit the study criteria were interviewed by phone for 90-120 minutes. Participants also filled out a basic demographic questionnaire online. During the recorded interview, I asked the participants to reflect on a series of questions based on their probationary years. Seventeen participants from across the country were interviewed in total;

however, due to three incomplete interviews and one corrupted file, the final analysis included 13 respondents.

Summary of Key Findings

In the previous chapter (Chapter Four: Results), I presented the findings of this study in great detail. My results were split into two sections. Section one focused on the challenges faced by the participants during their probationary years. Section two focused on the strategies that contributed to the participants' successful career advancement. Below, I briefly summarize the central findings of this study, beginning with the challenges.

There were five central challenges that the majority of participants faced amidst their probationary years. They were: (1) vague promotion and tenure expectations; (2) pressure to obtain external grants/publish; (3) managing work-life difficulties; (4) navigating a gendered and racialized academic landscape; and (5) service. The last three challenges (e.g., work-life difficulties, navigating a gendered and racialized academic landscape, and service) contained sub-themes. A variety of distinct issues contributed to the five main challenges and to the number of sub-themes that made up each category. Please see Table 5, located in the "Summary of Findings: Challenges and Strategies" section at the end of chapter four, for a brief visual summary of the five main challenges, the sub-themes, and the foremost issues that contributed to each category.

There were seven personal and external factors that made up the success strategies for the 13 Black and Hispanic/Latina woman faculty in this study. Despite the challenges, seven strategies enabled faculty participants to overcome these challenges and to advance their careers successfully from assistant to associate rank status. The seven strategies consisted of the following factors: (1) self-confidence, (2) self-efficacy, (3) personal agency, (4) a support

system, (5) an underlying drive to succeed in the professoriate, (6) professional socialization into the professoriate, and (7) a supportive departmental work-environment. Four out of the seven factors were personal strategies: self-confidence, self-efficacy, personal agency, and the possession of an underlying drive to succeed in the professoriate. Three were external strategies: the presence of a support system, working in a supportive departmental work-environment, and professional socialization into the professoriate.

These seven strategies were configured differently for each participant. A unique combination of these seven factors formed the basis of success for each individual. Importantly, *not* every participant's strategy profile included all seven personal and external factors, and the level of *presence* or intensity of any one of these factors *varied* from "high" (e.g., stronger) to less so. As a result, the path to tenure differed among participants, smoother for some than for others.

A *smoother* navigation process of the probationary years resulted for those participants whose strategies encompassed a strong presence of *all* seven personal and external factors because these strategies compounded over time. In contrast, the *fewer* the number and/or *weaker* the presence of these seven strategies, the more *difficult* their path was to success.

The foundation of *all* of the participants' success, however, included the following four strategies: (1) self-confidence (12 out of 13 participants), (2) self-efficacy (13 out of 13 participants), (3) personal agency (13 out of 13 participants), and (4) a support system (13 out of 13 participants). What differed were the *levels* of strength at which these strategies were present. These four "foundational strategies" were largely developed and in place *prior* to the time the participants entered the professoriate.

In contrast to the four foundational strategies, three additional "variable strategies" were also utilized. That is, three strategies varied among the participants because *some* (but not all) participants employed the following fifth, sixth, and seventh strategies: (5) an underlying drive to succeed in the professoriate (9 out of 13 participants), (6) professional socialization into the professoriate (6 out of 13 participants), and (7) a supportive departmental work-environment (10 out of 13 participants). Strategies five and seven (e.g., an underlying drive to succeed in the professoriate and a supportive departmental work-environment) contained sub-themes. Like the four foundational strategies, the *level* of strength or intensity at which the variable strategies was present varied from "high" to "low" (e.g., softer/weaker). For a brief visual summary of the seven strategies and their sub-themes, please see the table of success strategies below **(Table 5)**.

Notably, professional socialization into the professoriate and working in a supportive departmental work-environment (strategies six and seven in Table 5) *facilitated* a smoother path to tenure for those participants for whom these external factors were present. The *less* professionally socialized into the professoriate a participant was at the onset of their first tenure-track position, the more *critical* it was that participants worked in a supportive departmental work-environment to help foster their success. The benefits of working in a supportive work-environment only *compounded* for those who were also firmly socialized into the professoriate.

Thus, these two variable strategies were key facilitators to the participants' success because the *stronger* or *weaker* the presence of these two factors, the *smoother* or *rockier* the path to tenure. Ultimately, however, the participants had their four foundational strategies to rely on. In sum, an array of seven personal and external strategies contributed to the successful career advancement of 13 Black women and Hispanic/Latina STEM faculty participants.

Seven Career Advancement Strategies for WOC at PWI's	
Four Foundational Strategies	**Three Variable Strategies**
1. Self-confidence	5. An underlying drive to succeed in the professoriate • Critical agency • Career fit • Broader aspects of working in the professoriate
2. Self-efficacy	6. Professional socialization into the Professoriate
3. Personal agency	7. Supportive departmental work-environment • Collegiality • Department chair • Start-up package
4. A Support System • Personal support system • Professional support system	

Table 5. Seven Career Advancement Strategies: WOC = women of color (Black and Hispanic/Latina); PWI = predominately White institution (research universities); career advancement = promotion and tenure from assistant to associate rank status. Sub-themes are in bullets.

Before presenting a discussion of these results, it is important to be aware of the usefulness and limitations associated with the conceptual framework and design of this study. The allowance and constraints of parameters that led to the findings also rest within the interpretation of results below. First, I focus on the usefulness and limitations associated with the conceptual and theoretical framework, followed by the study design.

Usefulness and Limitations of Framework and Study Design

I encountered an overarching limitation in the faculty literature in searching for a theoretical framework on the successful career advancement of early career Black and Hispanic/Latina STEM faculty. As a result, it was necessary to develop a conceptual and theoretical framework that encompassed the challenges and strategies to fit the context of this study.

The faculty literature was useful because several bodies of literature (e.g., early career, STEM, women in STEM, and faculty of color) contain themes of known challenges for these different faculty groups. A lesser extent of challenges are currently documented for women of color faculty, especially for those in the STEM fields. Regardless, the availability of challenges within each of these bodies of literature enabled me to conceptualize the potential challenges for the participants in this study. Consequently, I was able develop a venn diagram (Figure 1, chapter three) that estimated the key challenges for early career women of color faculty in academic STEM fields.

The limitation to this was that these challenges were "piecemealed" together based on their speculated relevance of importance to the study participants. A fundamental level of uncertainty remained a part of the conceptual framework. Despite my best effort to remain attuned to issues that may have fallen outside of the challenges included in the framework, it is possible that some obstacles were overlooked.

Also, *because* salient challenges for this demographic group are not currently well understood, it was necessary for me to brush the landscape of challenges compiled across the various sets of literature. This enabled me to gain a basic understanding of what issues were relevant to the participants and which were not. However, in this process I sacrificed depth to instead focus on breadth.

For example, in my conversation with Olivia about the negative effects of tokenism, her response was, "this might go counter to what many other people might tell you, I always felt that being a Latina engineer has been a *great* advantage to me *because* I'm unique." In an effort to allow greater exploration of the central research question (e.g., what contributed to the participants' success), there was restricted time available to explore the details behind many such

responses. However, the challenges framework utilized in this study ultimately made possible an entrée for discussion about the challenges that are relevant to this demographic group.

The theoretical basis of social psychology and career counseling psychology used to examine the participants' strategies of success worked well. Social cognitive theory was useful because it allowed me to consider the participants' work-environments, individual behaviors (persistence), and intrapersonal strategies (self-efficacy, personal agency) as I investigated the central research question. Additionally, the "critical lens" for self-efficacy and personal agency, as well as the framework aspect titled "other/emergent," was also useful because it built in further flexibility and framing to guide my analysis of the data.

A drawback, however, was my lack of training in the field of psychology. This led to the inability for me to fully consider recommendations that require a deeper understanding of social and career counseling psychology concepts where the role of self-efficacy and personal agency in the successful career development of women of color STEM faculty is concerned.

With respect to the study design, I detail the shortcomings of the study design in the "Limitations" section of chapter three; please refer to this chapter section for a full description. I briefly review the study limitations here. First, there was variation in four areas: (1) faculty rank status of participants at the time of interview (7 associate, 6 full); (2) institution type where participants attained promotion and tenure (8 RU/VH; 5 RU/H); (3) faculty appointments and career advancement circumstances differed (3 participants); and (4) citizenship status differed (11 US citizens, 2 permanent residents). Also, there was an over-representation of participants that belonged in engineering fields over other fields (7 engineering, 4 science, 1 technology, 1 mathematics).

It was difficult to control the distribution of participants and institutions that were included in this study because the study design called for a purposeful snowball and networking

sampling technique. This choice of methods was due to the relatively low representation of *tenured* Black women and Hispanic/Latina faculty in the STEM fields at predominately White, research universities across the country.

Additionally, with only 13 participants I am unable to generalize the findings of this study. The small sample size limited my ability to meaningfully discern possible differences that exist between participants based on disciplinary cultures and expectations. However, differences were detected between racial categories and institution types for early career faculty participants. Also, while the number of Black women to Hispanic/Latinas was virtually even (7 Black, 6 Hispanic/Latina), there was more elaboration of issues related to race and ethnicity expressed to me by the Hispanic/Latina participants compared to the Black female participants. My own positionality as a Hispanic/Latina graduate student may have afforded but also limited the participants' comfort level with me.

Despite these constraints, the study design and the conceptual framework allowed for a discovery of novel insights about the success strategies implemented by 13 tenured Black and Hispanic/Latina STEM faculty participants as they advanced rank from assistant to associate status at predominately White, research universities. Next, I present the discussion of results. I first focus on the challenges uncovered in this study, followed by a discussion of the strategies.

Discussion of Results

Challenges

We know from the literature that a variety of challenges have been reported in research studies that focus on early career faculty; STEM faculty; women faculty, especially women in STEM; faculty of color; and in budding research that focuses on women of color. What is less clear is how the challenges in these reported sets of literature come together to represent the most

salient challenges for faculty who exist at the intersection of these distinct, but related bodies of knowledge. In the discussion of results, I begin by characterizing the nature of challenges revealed in this study. Second, I situate the findings of challenges to the current literature and discuss the meaning of the results. I then present a discussion of strategies.

Nature of challenges. The findings show that five leading issues emerged for the participants as they sought to advance their academic careers. Four key components characterize the *nature* of the five salient challenges uncovered in this study.

First, an important discovery is that the set of issues most salient for this group are *one from each* thematic area of research within the body of literature on faculty work. That is, the challenges of: (1) vague promotion and tenure expectations are well-established in the *early career faculty literature* (Austin et al., 2007; Gappa et al., 2007); (2) pressure to obtain external grants/publish is a main obstacle for STEM faculty that is identified in the *STEM faculty literature* (Anderson et al., 2007; Austin & Rice, 1998); (3) work-life difficulties is a key challenge named in the *women STEM faculty literature* (Fox, Fonseca, & Bao, 2011; Ong et al., 2011; Rosser & Taylor 2009); (4) navigating a gendered and racialized landscape is prominently cited in the *faculty of color literature* (Stanley, 2006; Neimann, 2011); and, (5) service is one of few challenges highlighted in the small, but growing sets of literature that focuses on *women of color faculty* across disciplines (Mertz, 2011; Turner, 2002). Thus, the primary challenges for the participants in this study parallel the findings in at least five thematic areas.

Second, the *compiled set* of challenges and many of the nuances that frame them is not reflected in a single current body of literature. That is to say, one cannot currently review either the early career faculty literature *or* the faculty of color literature *or* the women faculty in STEM literature (etc.) and draw conclusions with *certainty* about what set of challenges are most salient

for early career women of color faculty in STEM. In addition, a number of particular issues that comprise three of the five major challenge themes, especially the theme of work-life difficulties, provides evidence of unique concerns that are specific to early career women of color STEM faculty (discussed below). Thus, the findings from this study not only tap into multiple thematic research areas, they also contribute to them and simultaneously represent a distinct set of information.

Third, the *absence* of a particular challenge does not necessarily signify a *strategy* of success. True, an absence of a particular challenge may, in fact, *be* a strategy of success. For instance, a prominent theme found in the early career faculty literature is the difficulty for many probationary faculty to find mentors/guidance and to build collegial communities (Austin et al., 2007; Sorcinelli &Young, 2007). Collegiality and professional support systems were not reported as challenges in this study; rather, collegiality and professional support systems were reported as two important strategies that contributed to the participants' success. Similarly, obtaining proper laboratory space and equipment necessary to conduct research in a timely manner is a challenge often faced by STEM faculty (Austin & Rice, 1998). Yet, most of the faculty in this study reported obtaining proper laboratory space and/or the necessary equipment to get started on their research activities as part of a larger external departmental strategy that supported their success. In both of these examples, the absence of a challenge turned out to be a success strategy.

Still, I remain vigilant to assume that a nonexistent challenge is equal to a success strategy. For example, researchers have long identified that a fundamental problem for probationary faculty is to successfully meet multiple demands given the limited amount of time on any given day (Fink 1984; Whitt, 1991). Workload and time were *not* identified as a major

challenge faced by the participants. However, factors related to workload and time management were also not found to be strategies of success in this study. Until researchers have the opportunity to consistently and closely map out patterns of challenges and strategies relevant to this demographic group, I remain conservative to make such assumptions.

Fourth, the salient challenges for the participants in this study are categorized in at least three ways: personal, organizational, and disciplinary. For instance, vague promotion and tenure expectations is an organizational-related challenge, while heightened pressure to secure substantial levels of external grants is particularly relevant to faculty who are in the STEM fields (Anderson et al., 2007). Other challenges, such as work-life issues, navigating a gendered and racialized academic landscape, and difficulties related to service, overlap in characterization. For example, work-life issues create challenges in personal *and* disciplinary spheres. Furthermore, the nature of challenges that relate to navigating a gendered and racialized academic landscape can be characterized as personal, disciplinary, and/or institutional depending on the particularities of a situation.

Beyond the four main components that characterize the nature of the challenges discovered in this study, additional observations were made. It is possible that the list of challenges drawn from this study reflect a persistent set of issues for early career women of color STEM faculty across two decades, across two distinct ethnic/racial demographic groups, and also across institution types. A common set of themes was found across the participants despite the range of years that tenure was awarded (e.g., roughly half in the 1990s and half in the 2000s, see Table 1), that took into consideration the experiences of both Black and Hispanic/Latina faculty respondents, and that included women of color who achieved tenure at predominately White institutions classified as “very high” (RU/VH) and “high” (RU/H) research intensive universities.

However, without further research it is difficult to know with any degree of certainty how embedded or persistent any one of these challenges are or has been for this demographic group.

Finally, I was often taken by surprise when a challenge identified in the literature was present in a participant's context, but asserted instead as a *strength* in the participant's life (such one's token status). This made obvious to me that much is yet to be understood about the nature of challenges for early career women of color in STEM. As mentioned in the limitations section above, this study contains a small sample size. Without further studies that incorporate larger sample sizes that also disaggregate data by race *and* gender, institution type, discipline and faculty rank, I can only make claims with certainty about the nature of challenges faced by early career Black women and Hispanic/Latina STEM faculty based on the experiences of the 13 participants of this study. With this background and feel for the nature of the challenges revealed in this study, I present how these challenges are situated within the current literature.

Key challenges in relation to the literature. The findings of challenges both confirm and extend what is in the current literature. The themed challenges themselves are not unique—they are supported in existing bodies of literature as indicated above. Yet, the findings also suggest that the *set* of salient challenges and the *particular issues* that make up some of the individual categories constitute a distinct set of concerns that are not thoroughly identified or understood simply by reading five separate streams of literature.

Work-life difficulties is one such category. The findings of this study confirm a prominent challenge area that is well-documented in the current women STEM faculty literature. Several studies talk about the disproportionate delay of family formation for women faculty compared to male faculty due to an overlap of the probationary years with peak childbearing years (Rosser, 2004); the slowing down of women's STEM careers who have young children

(Xie & Shauman, 2005); and the majority of domestic and care-giving responsibilities continuing to fall primarily on women, including female scientists (Nelson-Gray, 2012; Schiebinger & Gilmartin, 2010). Each of these particular issues is described at some level by the participants as described in chapter four.

Within the work-life category, however, all but two participants who reported strain in their personal relationships resulted in divorce or separation. The women in STEM literature *does* address that dual-career issues are often magnified for women STEM academics because over 80% of STEM women are partnered to STEM faculty (Schiebinger et al., 2008). Thus, additional obstacles are often created for women STEM faculty often due to the difficulty to also obtain tenure-track positions for their partners, particularly at the same institution (Rosser & Taylor, 2009).

While "additional obstacles" are mentioned, the current literature does not pinpoint high rates of divorce or separation as a central issue for women in STEM. The small sample size used in this study may account for this prominent sub-theme, yet it also raises a level of concern as an issue that may be particularly acute for this demographic group and should be further investigated. Additionally, it did not ring true that a high percentage of the study participants were partnered to academic STEM faculty. Instead, participants' partners were in a variety of employment sectors (e.g., unemployed, a 'lesser job', a business founder, a non-STEM researcher, a lawyer), *in addition* to some who were in STEM tenure-stream careers. While much has been written about work-family balance for women in STEM, very little empirical information exists about work-life balance issues for women of color STEM faculty (Ong et al., 2011). These findings suggest that the current literature that focuses on work-life issues for women in STEM may stand to be expanded.

A second prominent work-life issue for women of color STEM faculty is that of work-life conflicts that are rooted in ethnic/cultural tensions with mainstream culture. This was particularly highlighted for the Hispanic/Latina participants in this study. I can only speculate on reasons that contribute to the noticeable absence of cultural related themes for the Black women faculty participants.

First, there may not be an existence of sub-themes for the Black female participants as it relates to ethnicity/culture beyond what is already included in the literature. Second, it is possible that the participants did not feel comfortable with me as a graduate student researcher, and/or as a person of a different ethnic/racial background, to share personal issues of family, values, and/or ethnic identity. Third, it may be that the sample size was too small and the composition of participant profiles did not afford the opportunity to detect ethnic/cultural related work-life challenges (e.g., two were single, one had a stay at home husband [e.g., no care-giving/domestic role pressures reported], another described having a supportive husband [e.g., no relationship strain reported], one participant declined to elaborate).

To my knowledge, the sub-category of Hispanic/Latina cultural work-life tensions *as well as* most of the specific issues within them (e.g., culturally traditional husbands; cultural value of family first; pressure to have children; expectation to be the primary domestic care-taker; and in some instances, language, US acculturation and a cultural norm to not question authority) are absent from the women in STEM faculty literature.

However, if one turns to the faculty of color literature, and especially the literature on Latino communities, research confirms what was highlighted in this study—gender schemas are ascribed to Latinas, especially regarding care-giving and domestic expectations and strong family-centric values (Ginorio, Guierrez, Cauce, & Acosta 1995; Hernandez-Truyol, 2003). Yet,

the faculty of color as well as ethnic studies centered literature largely fails to examine the potential impact of cultural nuances on faculty women who develop tenure-track careers in STEM. For instance, recall that Isabel, a Latina engineer, specifically cited cultural work-life pressures as the main reason she considered 'stepping down' early in her career.

There was no single body of literature that informed this study. The results thus far suggest a need for researchers to consider either establishing literature around this intersectional group as a stand-alone population, or to expand existing bodies of literature that commit to thoroughly disaggregating participant data. A greater understanding of challenges that lead to the underrepresentation of women of color in the STEM professoriate may likely result. These suggestions are especially important to consider with respect to women of color in STEM because this demographic group, in relation to their representation in these disciplinary fields, continues to be of great national interest now and into the foreseeable future.

Third, the list of *leading* barriers for the participants differed somewhat compared to what is written in the women in STEM faculty literature. For example, work-family balance, lack of professional networks, and challenges associated with dual-career partnerships are cited as prominent barriers (Rosser & Taylor, 2009; Ceci & Williams, 2007; Gourley et al., 2010; Anderson et al., 2007). Professional networks, in particular, were found to be in contrast to the literature because a professional support system was cited as an important success strategy for the women of color in this study, not a primary barrier. The explanation for this includes at least three possibilities. One, professional networks operate differently for women of color faculty. Two, professional networks may in fact be a primary barrier for women of color faculty; however, not for this small set of participants. Three, professional networks may not be a prominent issue for women of color who are successful.

To reiterate, in this study dual-career partnerships were also mentioned within the work-life challenge category as an area of strain for the participants. However, dual-careers were not identified as a major stand-alone primary barrier. Instead, it was one issue folded under work-life difficulties that contributed to a sub-theme of relationship strain. As previously noted, dual-career partnership scenarios appeared to differ for the participants compared to what is described in the current literature (e.g., the majority of participants were *not* partnered to STEM academics during their early career years). It is possible that the study results differ from the literature due to the study's small sample size. It is also possible that dual-career issues are shaped differently for women of color faculty in STEM. Further investigation of the particular nuances that make up work-life difficulties for women of color STEM faculty are warranted.

Fourth, "navigating a racialized and gendered academic landscape" is a theme that is not fully represented in any one body of literature *as it relates* to salient challenges faced by early career women of color in STEM. The faculty of color literature prominently reports challenges associated with navigating predominately White cultural and institutional landscapes for faculty of color (Stanley, 2006; Cooper & Stevens, 2002; Jean-Marie & Lloyd-Jones, 2011). However, this body of literature largely blends issues related to faculty of color across disciplines. Thus, for example, the patriarchal environment that many women often grapple with as a result of developing a career in the male-dominated fields of STEM is not well elicited.

On the other hand, the women in STEM literature *has* generated knowledge about the often gendered environments faced by women who develop faculty careers in STEM (Bystydzienski & Bird, 2006; Hill et al., 2010; Liang & Bilimoria, 2007). However, this body of literature largely overlooks in-depth analysis on issues that may be relevant for *all* women who are in the STEM fields, such as gendered racism for Black and Hispanic/Latina STEM faculty

members. Even so, several participants who acknowledged their token status or who experienced racialized and/or patriarchal scenarios responded in vastly different ways as described in the results chapter.

Fifth, service should be examined more closely as a particularly salient issue that impacts women of color faculty in STEM. The findings confirm previous research about service as an issue for early career faculty that relates to conflicting demands against workload and time (Gappa et al., 2007; Olsen, 1993). The study findings also confirm previous research about faculty of color experiencing a great amount of service requests to racially diversify panels and committees (Cooper & Stevens, 2002; Stanley, 2006). Research studies about women of color faculty state that they experience even greater service burdens than men of color and White women because they represent racial *and* gender diversity (Cooper & Stevens, 2002; Mertz, 2011; Stanley, 2006; Turner, 2002). The participants reported that between departmental, institutional, and national level inquiries, they did in fact receive constant service requests. The participants also acknowledged an awareness that they engaged in, and/or received, disproportionate diversity service requests compared to their colleagues.

However, this study also revealed that the participants held an internal sense of obligation to serve. This was *particularly* relevant as it related to student communities and disciplinary specific professional organizations that support students of color. Service is one of few themes that has been identified in the literature as a particularly salient issue for women of color faculty. To my knowledge, however, there is less understanding about the internal sense of obligation that women of color faculty feel *toward* specific service efforts. That is to say, the literature primarily documents the disproportionate number of service requests *received by* women of color faculty. Without a proper service agenda it is easy to understand how a constant flow of service

requests, in combination with the feelings of obligation to serve, can create a particularly salient obstacle for women of color faculty in STEM. Further research that thoroughly investigates the various dimensions of service for women of color faculty *in STEM* should be explored.

Finally, the early career literature contains a solid body of work that consistently identifies vague promotion and tenure requirements as a key challenge (Austin et al., 2007; Rice et al., 2000). The findings in this study confirm previous research. Additionally, the pressure for STEM faculty to publish and to secure external grants is another well-documented challenge that is in the STEM focused literature (Anderson et al., 2007; Goodstein, 2002), also found in this study.

What all of this means is that early career Black women and Hispanic/Latina STEM faculty not only face a number of unique issues as they seek to achieve promotion and tenure, but that they also experience an intensification of documented challenges compared to other early career STEM faculty groups, such as White women, men of color, or non-STEM faculty of color. For instance, recall that the majority of literature on women in STEM is based on the experiences of White women STEM faculty (see chapter two, critique of literature). White women STEM faculty report issues of sexism but not racism in the women's STEM literature, and men of color faculty report issues of racism but not sexism in the general faculty of color literature that group together the experiences of STEM and non-STEM faculty.

In contrast, women of color STEM faculty report experiencing sexism *and* racism (i.e., gendered racism) in addition to experiencing sexism *or* racism. This is one example of an issue that is unique for women of color in STEM, but also represents an intensification of sexism and racism due to the fact that it is many times also experienced simultaneously by this demographic group. Women of color in non-STEM disciplines may also experience gendered racism, but

possibly at a lower intensity if they reside in disciplinary homes that are not male dominated, such as in physics, mathematics, or engineering. Other examples that represent unique or intensified challenges for Black women and Hispanic/Latina early career STEM faculty include issues of service requests, cultural work-life difficulties (e.g., care-giving roles, expectations to have children, ethnic/cultural tension with mainstream culture), strain on personal relationships (e.g., high divorce or separation), dual-career constructs, and a number of other issues detailed in this section.

Therefore, based on the study findings, the salient issues for early career women of color in STEM, and the particular issues that shape each major challenge, both confirm and extend concepts that are in distinct but related bodies of faculty literature. Yet also, despite sharing some common issues that are identified in existing bodies of literature, the *total set* of major and nuanced issues that make up the primary challenges faced by this demographic group are distinct and not currently detailed with certainty in the early career, STEM, women in STEM, or faculty of color literature.

Without purposeful and detailed gender-race intersectional analysis, critical distinctions of women's experiences in the STEM fields is obscured. These findings suggest that much is yet to be explored and understood about the challenges faced by early career Black women and Hispanic/Latina STEM faculty. Next, I present a discussion of the strategies found in this study, followed by a summary of the discussion of challenges and strategies.

Strategies

In this section, I discuss the strategies utilized by the participants to manage the number of challenges described in the previous section. Specifically, I situate the findings of strategies in the literature from which the theoretical framework was based.

Key strategies in relation to the literature. Overall, a mixture of seven personal and external strategies was utilized by the participants in this study. This indicates that the participants relied on a multi-pronged approach to support their successful career advancement. This outcome aligns with findings from the early career faculty literature. For instance, Austin et al. (2007) and Gappa et al. (2007) assert that a single strategy is not enough to support the success of early career faculty, but rather, multiple strategies are necessary.

Conceptually, I was attuned to the possibility of more than one strategy as an outcome due to the incorporation of elements from Bandura's social cognitive theory into the guiding framework of this study. Bandura (1998; 2006) explains that a person's behavior influences and is influenced by personal factors *and* by the social environment. As a result, my framework focused on the concepts of self-efficacy and personal agency, as well as factors related to the external environment. The findings from this study align with this concept based on social cognitive theory. Recall that Avignon and others attributed their success, in part, to a bi-directional influence of their own behavior and choices (e.g., self-efficacy, personal agency) *in concert with* their external departmental work environment. I did not find that the participants *only* reported about their individual efforts or *only* about aspects of their external environment as it related to their strategy of success.

Even though Bandura's work acknowledges that social environments are important in the outcome of individual behaviors, social cognitive theory is not well explored in relation to faculty work-place environments. However, faculty development researchers have identified five work-place characteristics (collegiality, employment equity, flexibility, professional growth, and academic autonomy) that advance both institutional and faculty priority outcomes (Gappa et al., 2007). Using these five faculty work-place elements as a guide, the results of this study align

with the literature. Four of the five faculty work-place characteristics played a role in the participants' successful outcomes.

For example, several participants reported that working in a collegial department played an important role in their success. Further, collegiality was particularly critical for participants who had not been professionally socialized into the professoriate. Also, with respect to the theme 'underlying drive to succeed in the professoriate', the need for flexibility was an especially important factor cited by participants who are also mothers. Intellectual autonomy was also mentioned as an important factor for at least one participant in her desire or need to develop a successful faculty career. In this study, the importance of employment equity was most frequently referenced with respect to teaching. Participants mentioned that the receipt of a reduced teaching load supported their success as they started out because it alleviated stress. Also, the freedom to develop one's own course early in their careers contributed greatly to the satisfaction and empowerment of at least two participants. The fifth work-place element (i.e., professional growth) did not emerge as an important external factor in this study.

Even though self-efficacy, personal agency, and aspects of the department environments informed my thinking about potential strategies of success, I was surprised to learn how central these strategies were to the participants. Given that all of the participants successfully advanced rank, I did not expect to find varying degrees of intensity among these strategies (e.g., "low" to "high"), or a contrast in success profiles, or a variation in one's ability to navigate the promotion and tenure process. One reason that I did not anticipate these particular aspects is due to what I have come to understand through the literature.

The prevalent focus of challenges in the faculty literature, especially in the faculty of color literature, led me to the general impression that all or most faculty of color struggle as they

develop their careers in the professoriate. This contributed to my assumptions about the obstacles that women of color in STEM faculty face as they develop their careers, and about the *ways* such obstacles are experienced by women of color STEM faculty. As a result, at the time I anticipated that the participants would have generally experienced the same level and type of challenges described in the study framework, which is based on the literature. I did not foresee that participants may have struggled in a wide range of varying degrees. Further, since all participants are "successful," I was surprised to learn that in some cases participants navigated the promotion and tenure process quite smoothly with very few signs of 'struggling' at all.

Also, an important insight was that self-efficacy, personal agency, and self-confidence were largely developed through experiences earlier in the participants' lives. While developing these personal qualities as one enters a tenure-track position is presumably possible, firmly possessing such characteristics at the onset of one's early career may be a key ingredient to success. Further, despite my being attuned to the possibility of finding personal and external-departmental related strategies, I was not expecting to find the *degree* of partnership between these two categories. That is to say, the majority of participants attributed their own efforts *along with* departmental support as one reason they succeeded.

Due to the limited work that focuses on the successful faculty career paths of women of color in STEM, I was not certain how relevant psychologically-based strategies would be over practical ones. Because the unit of analysis was the individual, my primary focus was on how these individuals successfully navigated the promotion and tenure process. I expected to receive a list of *practical strategies*, but instead the participants elicited a set of broader strategies that largely relied on psychological factors as well as environmental aspects external to them.

However, it was not surprising to find that the participants took action as they faced obstacles since self-efficacy was found to be an important strategy of success. That is, since self-efficacy is embedded in a theory of personal agency, it assumes that individuals have some limited ability to control their lives (Bandura 1998; 2006). Thus, it makes sense that practical strategies were formed and executed. Several of the practical strategies are consistent with different streams of faculty literature.

For example, in the early career faculty literature Sorcinelli (2004) talks about the importance of junior faculty taking time to engage in outlet activities to support or enhance one's productivity. Two of the participants cited a regular routine of exercise as a practical strategy that helped them deal with work-related stress and pressure. In the literature that focuses on women faculty, one study found that mothers on the tenure-track hired housekeepers or had a backup childcare plan in place that helped them to alleviate issues related to work-family balance (Young & Wright, 2001). At least two participants implemented these strategies in addition to arranging for someone to drive their children to and from school three times per week.

Also, the literature that focuses on women of color recommends enlisting the help of others for psychosocial support if needed, particularly to help cope with issues related to navigating a culturally dominant academic landscape (Cooper & Stevens, 2002). At least two participants sought the formal support of a professional therapist. Further, all of the participants had some type of personal support system in place that served as emotional and/or psychological outlets, such as to talk about feelings related to isolation, tokenism, or generally about work-related stressors.

Additionally, the results about working in a supportive department as a strategy of the participants' success align with research on faculty, organizations, and women faculty in

academic STEM. For example, in works that focus on institutional level strategies based on what has been learned through the NSF ADVANCE program, researchers point to the need for STEM disciplinary cultures to shift to collaborative-oriented departments (Bystydzienski & Bird, 2006). Other studies such as Fox (2008) and Bilimoria et al. (2008) also write about the importance of structural factors, such as start-up packages, the role of department chairs, and space allocation that support the success of women faculty in the STEM fields. The findings in this study confirm what has been written about the importance of these external based strategies.

Several participants described their then-departments as collegial and recalled working with colleagues who shared 'pieces of their research' to help them get their research agenda going. Also, external factors, such as start-up packages and timely space and equipment allocations, facilitated and supported most of the participants' success. External departmental strategies were especially important to early career participants who were not professionally socialized into the professoriate and only catapulted the careers of those who were.

Department chairs were also reported to be important actors in most cases because they connected the participants to resources, mentored participants, fostered collegial departmental environments, and engaged in positive relationships with the participants. These findings confirm previous research that describes department chairs as pivotal because they facilitate integration of new faculty into the department, determine faculty assignments, and are point persons in the handling of departmental resources (Gappa et al., 2007). As previously mentioned, the participants not only described feeling supported by their department chairs, many attributed the positive relationship they had with their chairs to their successful promotion and tenure.

What the findings suggest is that it may very well be that both personal and external strategies are needed to optimally support the successful careers of early career Black women and Hispanic/Latina STEM faculty at predominately White, research universities. That is, it is possible that one formula of success for women of color in STEM includes bringing internal qualities to their first tenure-track position along with being matched up in a productive supportive environment.

Strategies that were not predicted by the study framework included (1) a support system, (2) self-confidence, (3) professional socialization into the professoriate. Even though critical agency was found to be an important factor that contributed to the broader strategy of 'an underlying drive to succeed in the professoriate', the broader theme itself was not considered in my original hypothesis. Further, the findings of critical self-efficacy contrast the theoretical tenets of Bandura's social cognitive theory.

Traditional self-efficacy tenets assert that mastery experiences produce stronger efficacy beliefs over vicarious learning, social persuasion, and affective states (Bandura, 1998). Instead, the results from this study found that participants primarily cited role models (vicarious learning) and words of encouragement (verbal persuasion) from their childhood and formative years as main producers of their efficacy beliefs about developing a successful career in a technical field. Although this study did not attempt to determine which of the four sources of self-efficacy were most important to the participants, these findings are consistent with at least two studies that focus on the development of self-efficacy of women who develop careers in male-dominated fields (Zeldin & Pajares, 2000; Zeldin et al., 2008). The particularities of these psychological-based faculty success strategies stand to be further examined.

Summary of Discussion

At present one must search and review five separate bodies of literature to piece together, with little certainty, a picture of what challenges may be most pressing for early career women of color STEM faculty. This study showed that the challenges unveiled for the participants were based on familiar themes from each major body of literature. However, the set of challenges themselves were not identified exclusively as key issues faced by early career women of color STEM faculty in any one body of literature (e.g., early career; STEM; women in STEM; faculty of color; women of color). Further, the particular issues that characterize many of the major challenges, such as work-life balance for women in STEM, are beyond what is currently captured in the literature. Additionally, this study found that challenges are perceived and experienced differentially by early career Black women and Hispanic/Latina STEM faculty.

This means that there is still much to be confirmed, refuted, and expanded upon with respect to thoroughly understanding what the challenges and strategies are for early career STEM women of color faculty who make tenure at predominately White, research institutions. For example, "gendered and racialized" challenge themes emerged in this study, so too were collegial environments as a strategy of success. Without further research in this area, it is difficult to tease apart the boundaries or interactions of these seemingly contradicting items.

However, the way that the participants navigated through the challenges identified in this study are insightful in at least three key ways. First, a good portion of the personal strategies are largely psychological in nature and partly reflect who the individuals are and the qualities that they bring to a work-place. These qualities, in turn, informed the participants' practical actions and strategies that also contributed to their success. Second, the foundation of those psychological qualities was largely developed because of experiences earlier in their life. Third,

it is very helpful if there are certain departmental factors in place where these individuals go to work, such as a department chairperson who is invested in the success of his or her early career faculty. Fourth, additional external strategies (e.g., support systems, professional socialization into the professoriate) also played a key role in the participants' success.

The significance of these strategies means that it is not *just* the quality of women of color themselves that lead to one's successful navigation of the promotion and tenure process. It is also the exposure to certain experiences that helped the participants as they moved along in their life *and* the particular departmental work contexts that they were in. In addition, the level of preparation for a faculty career and having a system of support also contributed to the participants' strategies. Therefore, the strategies of success ultimately involved the personal qualities that the participants brought to their first tenure-track position *along with* the quality of specific external factors. These findings show that a multiple strategy approach led to the successful navigation of the promotion and tenure process for early career women of color in STEM at predominately White, research universities.

Implications for Policy and Practice

The present study represents a first step regarding the examination of women of color who successfully navigated the promotion and tenure process. However, further studies are needed to further illuminate best policy and practical recommendations. With the assumption that the findings in this study remain consistent over time, several possible suggestions to improve policy and practice as it relates to advancing early career Black women and Hispanic/Latina STEM faculty should be considered.

Policy

The findings of this dissertation reveal that many challenges and individual issues faced by early career Black women and Hispanic/Latina STEM faculty are unique (e.g., gendered racism, cultural work-life difficulties) and need further exploration. Thus, policymakers may wish to incentivize program and research initiatives that focus especially on the experiences of Black women and Hispanic/Latina STEM faculty in order to fully understand the scope of challenges faced by this demographic group as they seek to develop careers in the professoriate.

For example, the NSF ADVANCE program could accelerate its focus on understanding and addressing the structural and cultural challenges that differentially affect Black women and Hispanic/Latina STEM faculty compared to majority women STEM faculty by creating a sub-program initiative dedicated to exploring this issue. Further, working in a supportive work environment was a key strategy of success for many women of color STEM faculty participants, especially for individuals who had not been professionally socialized into the professoriate. The leadership of, and positive relationships formed with, department chairs, receipt of a strong start-up package, and working in a culture of collegiality played important roles in fostering a supportive work-environment that facilitated the success of early career Black women and Hispanic/Latina STEM faculty.

Thus, the NSF ADVANCE program and other policymakers could consider targeting future efforts that focus on department chair training and on developing collegial and inclusive STEM work-climate strategies. In addition, it is important to learn more about what barriers chairs face as they strive to create inclusive and supportive environments for all faculty members. Finally, the NSF ADVANCE program could also consider establishing a regular session focused on informing the national community about what challenges women of color

STEM faculty face and what institutional strategies produce successful results as part of their annual national meetings.

Since this study revealed that a multiple strategy approach was utilized by early career Black women and Hispanic/Latina STEM faculty to successfully navigate the promotion and tenure process, it may not just be a matter of developing and supporting individual women of color STEM faculty. Likewise, it may not only be an issue of addressing external factors that optimize conditions leading to a greater representation of this demographic group. The multiple strategies identified in this study are personal *and* external in nature. Thus, policymakers should consider incentivizing activities (research, practice-based programs, and initiatives) that bring together individual *and* external strategies confirmed to play key roles in the successful career advancement of early career Black women and Hispanic/Latina STEM faculty.

For instance, in addition to focusing on programs that work on the structural environments that support the success of women STEM faculty (e.g., NSF ADVANCE), four foundational strategies (self-confidence, self-efficacy, personal agency, personal/professional support system) also proved to play an important role in the persistence and success of the participants. A key insight is that these strategies were largely developed throughout the participant's childhood and formative years, many of which were in school-based settings. Consequently, policymakers could focus on channeling funding to K-12 program initiatives that develop strategic STEM pathways for individual young girls of color that simultaneously offer experiences to develop their self-confidence, self-efficacy, personal agency, and support systems. Apart from focusing on increasing the number of girls of color who are interested in the disciplinary area of STEM, policymakers should ensure a component of activities that also fosters the four foundational strategies of success.

Further, this study revealed that one strategy of success for the participants included the role of professional disciplinary organizations in the lives of Black women and Hispanic/Latina STEM faculty. Involvement with professional disciplinary associations supported the successful STEM faculty careers of women of color faculty in the following ways: a key space where professional networks were cultivated for women of color in STEM (as students and as faculty members); an important platform where professional socialization into the professoriate occurred (as students); and an outlet for the development of a meaningful service agenda (as students and as faculty members).

Accordingly, scholarly associations should consider developing task forces that investigate ways in which their organization can strategically heighten the intentionality of its role in developing and supporting the successful career development of Black women and Hispanic/Latina STEM faculty through high-impact activities. For example, based on task force feedback, professional disciplinary organizations can develop long-term innovative conference agendas, strategic program planning, or professional services that optimally support the faculty career development of their women of color STEM student and faculty members. Scholarly associations can also develop best practices that include both challenges and strategies, and disseminate this information to member institutions. Further, professional disciplinary associations could form student and faculty advisory groups designed for and by women of color in STEM focused on STEM faculty career preparation and development.

Finally, those who were professionally socialized into the professoriate *prior* to assuming their first tenure-track positions displayed a marked advantage in their ability to successfully navigate the promotion and tenure process. The participants reported that their professional

socialization experiences were primarily the result of exposure to and engagement in activities at the undergraduate and graduate school level.

On average, the handful of participants who were professionally socialized into the professoriate also had a more extensive professional system of support developed at the start of their first tenure-track position compared to those who had not been professionally socialized into the professoriate. As a result, the former group had greater resources and individuals from whom to seek professional advice, for instance to negotiate a sound start-up package at the onset of their first tenure-track position. These findings suggest the significance of policymakers to support higher education institutional activities that develop focused professional socialization experiences aimed to develop the successful faculty careers for Black women and Hispanic/Latina students in STEM.

Practice

The findings from this study also have practical implications for various audiences—for young women of color who are *aspiring* STEM faculty, for *current* early career women of color STEM faculty who are beginning their careers, and for STEM department chairs and deans.

Aspiring STEM faculty. Aspiring Black and Hispanic/Latina students in STEM should take initiative to prepare themselves for a successful career in the academy. In this study, having a strong support system and being professionally socialized into the professoriate contributed to the successful career advancement of tenured women of color STEM faculty. Importantly is the fact that these strategies, used later in the participant's lives to successfully navigate the promotion and tenure process, were largely developed through certain activities during the participant's childhood and formative years. Thus, aspiring young women of color STEM

faculty should aim to engage in activities that promote the fulfillment of these strategies *prior* to the start of their first tenure-track position.

First, intentionally develop a personal *and* professional support system. A personal support system may include trusted individuals such as family members, friends, professional peers, partners/spouses, or therapists. One's personal support system may also include faith, physical activity, or other relaxation activity outlets. Prior to the start of a tenure-track position, young women of color may find it particularly useful to ensure that their systems of support include individuals (or outlets) that provide them with support in areas that differentially affect women of color STEM faculty (e.g., cultural work-life tensions, gendered racism). The recommendations provided below focus on ways that aspiring Hispanic/Latina and Black young women STEM faculty can cultivate a *professional* support system.

Young women of color could serve in leadership capacities at regional or national professional disciplinary and/or ethnicity-affiliated disciplinary associations over their high school, undergraduate, graduate, and post-doctoral years to get in contact with peer and senior professionals who may become a part of one's professional network. Young women of color should also consider interning or engaging in volunteer STEM research positions at high school, junior college, and/or university laboratory settings in order to increase their chances of developing a professional network. Another way to develop a professional network during one's school and college years is to shadow a set of STEM disciplinary professionals in a university work-setting, including shadowing current women of color STEM faculty.

In each case, an awareness of intentional and proactive relationship building should be present; relationships should be managed and sustained over time. The more extensive one's personal and professional support system, the greater number of individuals or forms of support

aspiring young women of color STEM faculty may rely on at a moment's notice as they step into their first tenure-track positions.

Another step that young women of color should engage in to prepare themselves for a career in the STEM professoriate is to pursue professional socialization activities. The recommended activities above that serve to develop one's professional network also provide experiences that promote professional socialization into the professoriate. However, beyond developing and sustaining professional relationships, a second important purpose of engaging in such activities pertains to the activities themselves.

Young STEM women of color should keenly stay attuned to what it may be like to become a future STEM professor. As individuals increasingly involve themselves in professional socialization activities, aspiring STEM women of color faculty may also wish to conduct periodic and critical self-assessments to determine their interest and to assess their preparation for a faculty career. For example, Black and Hispanic/Latina young women in STEM can ask themselves: Do I enjoy what I am learning and doing? Why or why not? Can I envision myself as a professor in STEM? Why or why not? What does it mean to be a Hispanic/Latina or Black female STEM faculty at a research university? In what relevant areas should I gain further experience? How or where can I get answers or further information (e.g., informational interviews, books, internet, articles) to answer my questions?

Also, since teaching is a main responsibility of a STEM professor, young women of color in STEM might want to gain student teaching experience, ask to volunteer in a classroom capacity, or participate in a teaching fellowship or teacher training certificate program. Strong grant writing skills are also necessary to succeed in the professoriate. To promote preparation into this role, young women of color in STEM can practice their grant-writing skills by applying

successfully to increasingly competitive scholarships and fellowships, and asking for written feedback.

Finally, it is critical for aspiring Hispanic/Latina and Black young women STEM faculty to become familiar with the promotion and tenure reward system, and the particular issues and strategies relevant for women of color faculty in STEM. Self-directed readings or conducting informational interviews are two ways to access this information. Pursing activities that support the development of one's personal and professional support system and one's professional socialization into the professoriate will greatly enhance the successful outcome for aspiring Black and Hispanic/Latina young women STEM faculty.

Current STEM faculty. It is important that *current* early career Black women and Hispanic/Latina STEM faculty possess the following four foundational strategies of success: self-confidence, self-efficacy, personal agency, and a support system. In addition, an important insight is that the intensity level of each strategy, both foundational and variable strategies, ranged from high-to-low for the study participants. Individuals who possessed a high intensity of all seven foundational and variable strategies (four foundational and three variable strategies) experienced a smoother promotion and tenure navigation process compared to individuals with fewer and less intense strategies present. While an individual may have less control over some of the variable strategies of success, such as working in a supportive departmental work environment, the four foundational strategies identified can and should be cultivated or enhanced individually if they are not fully developed prior to the start of one's first faculty position.

Self-efficacy is one of the four foundational strategies. If an individual determines that she lacks a sense of self-efficacy or possesses a low sense of self-efficacy, she may work on strengthening her self-belief to successfully develop a faculty STEM career. To begin,

individuals can learn more about the four sources that develop one's sense of self-efficacy regarding the development of a successful STEM faculty career. The four sources are: mastery experiences (e.g., performing an activity successfully), verbal persuasion (e.g., words of encouragement), vicarious learning (e.g., role models), and affective states (e.g., ability to handle or manage stress, anxiety).

One of the things for women of color to consider as they begin their careers is to conduct a personal exercise where they reflect on their past experiences and ask themselves what kind of lessons they have learned early in their lives that can give them a sense of self-efficacy. A second approach to consider is to seek external professional or personal support, and engage in activities that will "boost" the development of their self-efficacy that are grounded in the four sources. For example, if one does not feel self-efficacious about grant writing or teaching, one should seek training or consultation in these areas (mastery experiences). If an individual is having difficulty managing stress, one may seek counsel from a therapist, participate in a workshop that teaches about stress coping techniques, or schedule a regular creative or physical outlet to manage stress levels (affective states).

A second foundational strategy that can be cultivated or enhanced is personal agency. Since self-efficacy is the foundation of personal agency, individuals may naturally feel an increased sense of personal agency in relation to a particular activity en route to tenure (e.g., how to write a successful grant), or regarding the larger goal of making tenure at-large. Even so, an additional step to increasing one's personal agency includes becoming familiar with the four properties that characterize personal agency. They are: intentionality (e.g., deliberately forming intentions and action plans for realizing them), forethought (e.g., visualized futures are brought into the present as guides and motivators of behavior), self-reactiveness (e.g., linking thought to

action), and self-reflectiveness (e.g., reflecting on pursuits, and making adjustments if necessary).

Early career Hispanic/Latina and Black women faculty in STEM could construct weekly activities that promote a sense of agency. For instance, commit to scheduling a short time block one day a week; ask and answer the following questions: What is my intention in relation to (identify an activity or goal)? What is my plan for realizing my stated intention? What do I envision my future to look like? What action steps will help me to execute my plan and realize my goals? Though one could conduct this activity on a regular basis, these questions may be considered in short-term (daily, weekly) or long-term (monthly, yearly) timeframes. Also, it is important to take the time to periodically reflect and adjust one's intentions and plans when necessary.

A third foundational strategy that contributes to successfully navigating the promotion and tenure process is self-confidence. Thus, self-confidence can be cultivated or enhanced. The results of this study show that the participants developed varying levels of self-confidence largely over their childhood and formative years. However, self-confidence is a personality trait that can also be addressed as one begins the early career. Should this be an area of concern, early career women of color in STEM may consider turning first to their personal support system to "talk about it."

One's personal support system can help Hispanic/Latina and Black women STEM faculty identify the root of the issue and can help to identify potential solutions. Second, if there are specific STEM-related concerns that a personal support system cannot help with, early career women of color should consider *carefully* selecting a disciplinary-specific peer colleague or trusted senior mentor with whom they can share and talk about confidence concerns.

Alternatively, Hispanic/Latina and Black women early career faculty in STEM could also join women of color STEM faculty mentoring/support groups online (blog spots, virtual circles), or access further resources through professional organizations (e.g., Society of STEM Women of Color, National Center for Faculty Development & Diversity) to implement activities that will enhance self-confidence while remaining as anonymous or identifiable as one feels comfortable. Finally, early career women of color STEM faculty may wish to independently watch webinars, videos, subscribe to programs, or read about strategies that aim to improve one's self-confidence.

The fourth foundational strategy that current early career women of color STEM faculty should cultivate or enhance is a support system. This study showed that having a support system, both personal and professional, was critical to the retention and advancement of women of color STEM faculty. The more extensive ones' personal *and* professional support systems, the greater level of support that was available for emotional, psychological, and professional related relief and advice. The following recommendations focus on ways that a *professional* support system can be cultivated or enhanced.

Current early career women of color STEM faculty can bolster their professional support system by serving in a short-term or long-term leadership role within a disciplinary-specific, professional organization at a campus, regional, or national level association. Another way to expand one's professional support system is to think strategically about service requests. For instance, take advantage of serving on hiring committees or diversity committees by utilizing that space as a platform to initiate relationships with key campus individuals. This strategy can lead to unanticipated successful research collaborations, grant opportunities, and an expanded professional support system. Within this capacity, one could also elect to serve as part of a sub-

committee or sign up for certain work-force tasks to build a professional rapport by working closely with particular individuals.

While the issue of service is not one of the four foundational strategies, receiving a high volume of service requests was found to be a challenging issue for many early career Hispanic/Latina and Black women STEM faculty. One way to reduce this pressure is to learn and practice saying no, or to rethink service activities to instead create a *service agenda* that is focused and intentional.

For instance, if one's current service activities feel unfocused or overwhelming, individuals could elect to serve only in capacities that are aligned with one's STEM research agenda, discipline, and/or with populations that early career women of color STEM faculty wish to serve, such as students of color in STEM. Instead of volunteering to help organize a campus-level recruitment event for underrepresented STEM students, for instance, faculty may instead wish to offer summer spaces in their laboratories where underrepresented students may gain hands-on STEM research experience. This way, early career women of color STEM faculty are given opportunities to "give back" or to mentor underrepresented STEM students while closely aligning service time to research productivity. By cultivating or enhancing the four foundational strategies of success, current early career STEM women of color faculty may further facilitate their successful career advancement.

STEM department chairs and deans. Many STEM department chairs and deans are interested in ensuring that faculty in their units feel well supported. The findings of this study show that working in supportive work environments played a critical role in the success of early career women of color STEM faculty. Thus, some of the ways that chairs and deans could

fruitfully support early career Hispanic/Latina and Black STEM women faculty include ensuring a positive and supportive faculty work climate.

First, chairs might consider whether there is a climate within their department that makes it clear that everybody is valued. Similarly, deans might consider whether there is a supportive climate at the college level. Department chairs and deans might also think about whether they are recognizing that there is never a magic formula for getting tenure. It is critical to ensure that early career faculty, including women of color faculty, are getting clear feedback and information about what is expected, and about what resources are available to them, such as funding resources.

In addition, the findings from this study confirm that early career Hispanic/Latina and Black women STEM faculty face unique challenges as they seek to achieve promotion and tenure. In particular, women of color disproportionately receive service requests at departmental and institutional levels that are often based on the need to diversify committees.

One way that department chairs and deans can support the success of junior women of color STEM faculty is to ensure that they do not carry a disproportionate number of faculty service commitments. Early career Hispanic/Latina and Black women STEM faculty are frequently "in demand" in terms of service requests due to their underrepresentation in STEM faculty roles, the need to diversify committees, and a growing number of diverse students (both STEM and non-STEM) who seek their individual mentorship or involvement as speakers or advisors to various student-oriented activities.

Even though many departments currently provide protective measures regarding service duties assigned to or requested of early career faculty, chairs and deans may wish to take special measures to protect service time from early career STEM women of color faculty. For instance,

chairs and deans could prepare to strategize around the need for diverse representation on service committees prior to the start date for newly hired Hispanic/Latina and Black women STEM faculty. This is *especially* pertinent if there is only *one* or less than a handful of early career Black or Hispanic/Latina female STEM faculty member in a particular environment.

Also, the participants in this study asserted that an important aspect of their success was receipt of a solid start-up package. Items such as a reduced course-load, a fair salary, and timely access to laboratory space and research equipment played an important role in their success. Thus, department chairs and deans could take special care to ensure that early career women of color STEM faculty are offered a strong start-up package. In addition, before an offer is made, a laboratory space could be identified and made available for viewing by the prospective candidate to support a thriving situation for both the individual and the department. If a laboratory space is located but is not fully functional, chairs and deans should consider acknowledging this institutional deficiency and adjust the candidate's tenure clock accordingly. Finally, a reduced teaching load could be provided to all early career faculty, especially women of color in STEM, as they transition into a new faculty role in an effort to provide conditions that cultivate the success of early career women of color in STEM.

Further Research

Since investigating the successful career paths of women of color STEM faculty is largely unexplored, there are many potential research directions. Several recommendations for future research are mentioned throughout the discussion of results section, above. However, researchers may also wish to extend this line of inquiry in three specific ways: (a) research designed to develop models, theories, and empirically grounded frameworks to understand successful faculty career development, especially for women of color in STEM, (b) research

designed to refine and to investigate, in-depth, each challenge and strategy revealed in this study, and (c) research designed to compare the challenges and strategies of successful women of color in STEM to those who did *not* successfully advance their careers. Generalizations and consistent patterns would likely emerge if the sample size in each of the three suggested research areas is increased.

First, one of the limitations in this study was the shortage of empirically-grounded theoretical and conceptual frameworks available to examine the successful career development of early career women of color faculty, especially those in the STEM fields. This study presented a framework that was developed from the faculty development literature along with concepts of social cognitive theory. The findings show that certain aspects of the framework was confirmed, while other findings fell outside of the presented framework (see sections: 'key challenges in relation to the literature' and 'key strategies in relation to the literature').

For instance, aspects of the framework that were confirmed included concepts of self-efficacy and personal agency; they played an important role in the participants' faculty career success from assistant to associate status at predominately White, research universities. Yet, other factors emerged as important success strategies, such as professional socialization into the professoriate and self-confidence, but were not a part of the original framework. Also, other theoretical areas to consider include frameworks grounded in the career counseling and career development literature such as agency theory and resilience theory. Furthermore, five salient challenges emerged as prominent issues faced by this demographic group. The framework and results of this study may serve to be refined, expanded upon, or considered as a starting point for future directed theoretical frameworks about successful early career Black women and Hispanic/Latina faculty in STEM.

Second, researchers may wish to investigate each of the four strategies and five challenges uncovered in this study in greater depth. As previously mentioned, a limitation of this study was the need to sacrifice depth in order to address a breadth of items due to the exploratory nature of this study. For instance, researchers could discern why certain challenges are interpreted or experienced differently by early career women of color STEM faculty, such as one's token status interpreted as a factor of empowerment versus a debilitating scenario. The participants in this study are not only examples of early career women of color in STEM who succeeded—they also are women who defy stereotypes. In the future, one could study more about the paths they have taken and examine how and why they are so resilient.

Researchers should consider focusing on discerning what early life experiences contribute most profoundly to the 'four sources' of self-efficacy that relate to women of color's efficacy beliefs about their ability to develop a successful faculty STEM career. Studies that incorporate a larger sample size could expand, contradict, or confirm this study's findings and might also prove beneficial to detect further parallels and distinctions between the challenges and strategies that affect Black women and Hispanic/Latina faculty in STEM. In this vein, other issues to explore include conducting a detailed analysis of the differences and similarities in career path and science identity development between Hispanic/Latina and Black women STEM faculty. Further, an interesting study would be to compare and contrast *those* findings with the career paths and science identity development of Hispanic/Latina and Black women faculty who are social science faculty members.

Third, a compelling study would be one that utilizes the same framework to compare findings for Black women and Hispanic/Latina STEM faculty who "dropped out" or who did not successfully make tenure with those who successfully developed a STEM faculty career. In this

study, three distinct success profiles emerged. In order to build a solid foundation of knowledge that reflects a true understanding around the challenges and strategies of this demographic group, it is important to also rule out potential differences as well as reinforce similarities that may be present between successful and less successful participant groups.

Concluding Remarks

The development of successful academic careers by women of color in STEM fields is currently a nationally prioritized area of interest. The purpose of this study was to increase the understanding about what factors contribute to the successful career advancement of women of color STEM faculty. In particular, the main objective was to learn about the strategies that led to the successful rank advancement of Black women and Hispanic/Latina STEM faculty from assistant to associate status at predominately White, research institutions.

An important finding was that a multi-pronged personal and external strategies approach served as a formula of success for 13 tenured Black and Hispanic/Latina faculty. However, much remains to be investigated in this rich area of study. A need exists to establish a solid literature base that can be used to inform best practices for individual women of color faculty who seek to develop successful STEM faculty careers in predominately White, research university settings. Similarly, there is a continued need for researchers to conduct empirically grounded studies in order to develop institutional-based best practices and policies that will increasingly lead to the successful career advancement of early career Black women and Hispanic/Latina STEM faculty.

APPENDICES

Appendix A

Semi-Structured Interview Protocol

Research Question: *What contributes to the successful career advancement of women of color faculty in the fields of academic science, technology, engineering, and math?* My sub-questions are:

a) What strategies did tenured Hispanic/Latina and Black women faculty in the STEM fields enlist to successfully overcome personal, organizational, and disciplinary related challenges amidst the early career promotion and tenure process?

b) What factors enabled them to persist through these challenges?

(Quick Definition Guide for Interviewer Use Only):

FOUR SOURCE OF SELF-EFFICACY:

• Performance accomplishments: mastery experiences, past performance accomplishments (+)

• Vicarious learning: having role models; or observational models

• Affective states: ability to handle emotional states (e.g., stress, anxiety, tension…), moods

• Verbal persuasion: receiving encouragement, positive appraisal

FOUR PROPERTIES OF PERSONAL AGENCY:

• Intentionality: *deliberately* form intentions, action plans/strategies to achieve an outcome

• Forethought: *visualized goals* of anticipated outcomes guide and motivate efforts/choices

• Self-reactiveness: *linking thought to action*, ability to construct appropriate courses of action and regulate their execution/monitor progress

• Self-reflectiveness: reflect on meaning of pursuits; judge correctness of thinking against outcomes of actions, make corrective adjustments if necessary

Pre-Interview Commentary:

- Welcome and thank the faculty member for meeting with me.
- Introduce/provide an overview of my study verbally:
    - Briefly introduce myself.
    - Overview of study: My purpose in speaking with you today is that I'd like to learn about your experience during your junior faculty career stage--in particular, what contributed to your success. I'd like to focus on the type of challenges you faced during that time, how you managed those situations, and what you believe contributed to your success in achieving promotion and tenure as a woman of color in the science and engineering fields. (Elaborate further if needed).
- Confirm receipt of consent form. Review consent form, ensure faculty consents to participate. Ensure participant has my contact information.
- Confirm receipt of demographic questionnaire. Double check pseudonym.
- Gain participant's permission to record the interview digitally.
- Questions?
- Permission to now turn on digital recorder.

Establish Rapport:

Review pre-submitted demographic information:

- "Usually the best place to start is for me to ask if you would say a little bit about yourself in terms of:
    - Your current home department and institution;
    - What your current role is at the university; (e.g., associate professor etc.)
    - What your current research area is; and
    - How long you've been at your current place of employment."

- "I also want to make sure that I understand that you…"
    - (See responses, demographic questionnaire #'s: 4,5,6, & 7)
        - Year granted tenure
        - Institutions tenure was granted
        - Department tenure was granted
        - Faculty appointment at the time

Segue To Interview Questions:

"Now, this will just be a conversation about your promotion and tenure experience as a woman of color S&E faculty member. As I mentioned, I'm interested in learning about what contributed to your success in advancing from an assistant professor to a tenured associate professor…."

Theory/Framework	Interview Protocol
Overview Question	**1) Can you tell me more about your promotion and tenure experience, and what you believe contributed to your success?**

Environment: climate, culture, workplace	**2) What were the requirements for your promotion and tenure?**
	
	Probes:
	• What were the expectations that faculty members in your dept. faced in terms of grant money, research, and teaching? (Keep aware to public vs. private institutional differences)
	
	• R$\bar{e}$ number of years to tenure: What contributed to that timeline?
	
	• As a jr. faculty, did you ever think about leaving the professoriate?
	  ○ If so, what compelled you to stay?
	  ○ If they moved→When and why?

Intrapersonal: cognitive, affective, (personal agency and SE), biological Challenges	**3) What type of challenges or issues did you experience during your promotion and tenure process?** *Probes:* see diagram pg. 63 • Work-life balance, dual-career, network/mentoring (women) • Tokenism, bicultural stress, code switching (faculty of color) • Publication pressure, funding decreasing, culture/climate (science) **4) What was your thought process / emotional process like around those challenges at the time? (especially in relation to P&T)** *Probes:* • (Intentionality): Did you ever find yourself deliberately planning in a way that you believed would lead you to a certain outcome? (If so, can you tell me about that?) • (Forethought): Some people find it helpful to actually envision in their mind what success looks like. Did you do any envisioning like that? (If so, can you give me an example?) • (affective states (handling of emotions)): How did you cope? How did you perceive and interpret emotional reactions to these challenges?

Table 6. Interview Protocol: The right side of the table reflects the interview questions. The left side of the table categorizes the theory or framework perspective that each question is rooted.

Table 6. (cont'd)

Theory/Framework	Interview Protocol
Behavior: Strategies Strategy development	**5) What actions, or inactions, did you take as a result of your thinking around the challenges you faced at the time?** *Probes:* • (self-reactiveness): Did you ever find yourself monitoring your progress toward fulfilling the choices you made? • (self-reflectiveness): Some people find it helpful in the context of the challenges you've discussed to step back and spend some time alone reflecting or assessing about the situation and what to do about it. Does this resemble a part of your process at all? (If Yes→can you elaborate a bit?)
Bidirectional Triadic Interactions: Environment Intrapersonal Behavior	**6) What enabled you to persist through these challenges?** *Probes:* • (verbal persuasion (encouragement)):Were you, at any time, encouraged or discouraged to continue on with your career pursuit? • (performance accomplishment): Were there any particular experiences that helped you to develop your sense of ability that you were "cut out" to be an academic scientists? • (vicarious learning (role model)): Did you ever have the opportunity to learn from or observe others in a way that influenced you to pursue a faculty career?
Closing Question	"Up to now, we've discussed several things: some of your challenges, how you thought through them, and some of the actions you took…" **7) How did this all add up to attribute to your successfully achieving tenure?**

Concluding Questions:

- Is there anything else you would like to share with me about what we have discussed today?
- Do you have any questions for me?
- *Turn recorder off.*

Post-Interview Commentary

- Thank the faculty member for their time.
- Ensure faculty member has my contact information.
- Remind faculty member that they will receive a $20 gift certificate through email within 48 hours.
- Items to briefly discuss:
  - Encourage participant to write down additional thoughts post-interview and email them to me as soon as possible thereafter.
  - Ask professor if she would be open to scheduling a 60-minute follow-up interview in about one month to: a) member check statements b) clarify any new questions that may have risen after initial analysis of data. Schedule if possible.
  - Review confidentiality procedures that are already in place (e.g., pseudonym use, cryptic code/case number assigned, option for faculty to review transcript upon completion to ensure accuracy, research data stored in locked filing cabinet). Ask faculty member if there are other specific measures they would like me to take so that they feel comfortable that their identity and content of this interview will remain private and confidential.

- Conclude Phase I interview with faculty member.

Post-Interview Analytic Notes/Researcher Debrief:

1. What was my overall impression of the participant's experience?
2. What was the major theme(s) of this interview?
3. What was the most interesting thing that I learned? What stands out?
4. What struck me as unusual, unclear, or a topic area that I may need to follow up on?
5. What connections can I make with the literature? What information was brought to light that the literature/my framework did not cover?

Appendix B

General Interview Probes

- Say more about that.
- Explain that to me.
- Why is that important to you?
- Tell me what happened.
- Can you give me an example of that?
- What was that like for you?
- Why did that matter to you?
- What made you think of that just now?
- What led up to that?
- What happened next?

Appendix C

Demographic Questionnaire

The information that you provide below will be kept strictly confidential. You reserve the right to refrain from answering any question(s) that you do not wish to answer. Where appropriate, feel free to elaborate in your answering of the questions below.

1. **To protect your identity, please provide a pseudonym in place of your full legal name:_____**

2. **What is your citizenship status?:**
   ____U.S. citizen _____Permanent Resident ____Other

3. **How do you identify? Please describe your ethnicity in the text box (e.g., Mexican-American)**

   ____Black (text box displayed on SurveyMonkey to the right of each racial category)

   ____Hispanic/Latina

   ____Asian/Pacific Islander

   ____Biracial

   ____Multiracial

   ____Other

4. **In what *year* were you granted promotion and tenure (from assistant professor to associate professor)?**

5. **At what *institution* did you achieve promotion and tenure (from assistant professor to associate professor)?**

6. **In what *department* did you achieve promotion and tenure (from assistant professor to associate professor)?**

7. **What was your faculty appointment type when you achieved promotion and tenure (from assistant to associate professor)?**

____Full-time, tenure-track
____Part-time, tenure-track
____Other (please explain):

8. What is the name of the institution where you are currently employed?

9. What is the name of your current department(s)?

10. What is your current faculty rank status?
____Assistant professor
____Associate professor
____Full professor
____Other

11. Briefly name one issue that you recall as a main obstacle or challenge that you faced during your junior faculty promotion and tenure years:

12. In a few words, briefly describe how you overcame or dealt with the challenge that you named in the previous question (question #11):

13. Are you amenable to consider a "phase II", 30-60 minute follow-up interview?
___Yes
___Maybe
___No

14. Comments or questions about this survey, upcoming interview, or this dissertation study? Please express them here.

THANK YOU

Appendix D

Dissertation Study Email Invitation

Dear _____,

Per our conversation, here is the information about my dissertation study titled, "Women of Color Faculty in Science and Engineering: Successfully Navigating the Promotion and Tenure Process" (IRB# X13-072e, Michigan State University). *I am writing to ask if you may know of anyone who may be willing to participate in my study?*

Currently, I am actively seeking associate and full rank faculty who are in the fields of engineering, life and physical science to participate in my study by conducting a one-on-one interview with me. Participants must be women who identify as Black and/or Hispanic/Latina, must be US citizens or permanent residents, and must have achieved promotion and tenure (assistant to associate) at a research intensive, predominately White institution. The privacy and confidentiality of participants will be protected to the maximum extent of the law, and all data will be de-identified.

The interview will take approximately 1.5 hours, and no more than 2 hours (depending on how much time individuals have to share). I am conducting interviews in April and May 2013 and I would be pleased to accommodate the schedules of those who are willing to participate.

The objective of this study is to examine what contributes to the successful advancement of Hispanic/Latina and Black women faculty from *assistant to associate* status in the academic fields of science and engineering from the perspective of the women faculty themselves. Please see the summaries attached for full details (Attch1: call for participation; Attch2: project summary).

Reflecting on their past experience, I would like to discuss with participants the challenges that they faced as a junior faculty members in their disciplinary field, how they resolved or managed those challenges, and what factors contributed to their persistence through the promotion and tenure process from assistant to associate rank status as women of color faculty in academic science and engineering.

I kindly request the following:
* Please forward this request (including attachments) to individuals who may be interested in participating in this study, or to individuals who may be able to assist in circulating this invitation.
* Please contact me with any questions. My email addresses and telephone number are below, and are also included in the attachments.

I appreciate your time to consider forwarding this invitation to colleagues who you may know. The participation of interested faculty members will be very important in contributing to greater knowledge about the career advancement of women of color faculty in science and engineering. If you know of someone else who may also be appropriate to contact, please let me know.

Sincerely,
Melissa Soto
Doctoral Candidate, Department of Educational Administration, Michigan State University
Email: msoto1@msu.edu
Tel: [text removed]

Appendix E
Call for Participation

WOMEN OF COLOR FACULTY IN SCIENCE AND ENGINEERING: SUCCESSFULLY NAVIGATING THE PROMOTION AND TENURE PROCESS

IRB# X13-072e, Michigan State University
PI: Dr. Ann Austin
Doctoral Candidate: Melissa Soto

Seeking associate and full rank Hispanic/Latina and Black women faculty who achieved promotion and tenure at a Research-I, predominately White institution in engineering, physical or life sciences

I am conducting a dissertation study of racially underrepresented minority tenure system faculty members in engineering, life and physical sciences. I am currently seeking tenured *associate* and *full* rank faculty women who identify as Black and/or Hispanic/Latina, who have achieved promotion and tenure from *assistant to associate* status at a predominately White (PWI), research intensive (R-1) university, and who are US citizens or permanent residents to interview for this dissertation study. Participants do not need to be currently employed at a PWI R-1 to participate in this study, nor do they need to be currently employed at the same institution where they achieved promotion and tenure from assistant to associate level.

Pending geographical location and preference of the participant, the interview can be conducted via telephone or in person. The one-on-one interview lasts approximately 1.5 to 2 hours, depending upon your availability. I plan to conduct interviews through May 2013, and would be pleased to accommodate your schedule. As a gesture of appreciation for your time, a $20 electronic gift card to Amazon.com will be provided to all participants upon completion of the initial one-on-one interview.

The goal of this study is to learn more about how and why the relatively few women of color in these tenured positions have succeeded. Despite increased efforts to recruit, retain, and advance women of color faculty in science and engineering, this demographic group remains underrepresented in the professoriate, especially as tenured faculty members at R-1 PWI's. Gaining this information will not only allow us to better understand work environment issues, it will also provide insight concerning the experiences of individual scholars of color who successfully advanced their faculty careers.

My dissertation study is directed by my advisor, Dr. Ann Austin, Professor in the Department of Educational Administration at Michigan State University. This is a dissertation study in partial

fulfillment of the requirements for the degree of doctor of philosophy. Your confidentiality is a high priority and will be protected to the maximum extent allowable by law. I hope that you will agree to share your experience in this important and exciting study. Questions? Willing to share your experience? Please contact:

Ms. Melissa Soto
Doctoral Candidate, Higher, Adult, and Lifelong Education
Michigan State University
Tel: [text removed] **Email:** msoto1@msu.edu (Subject: Study Participation)

Appendix F

Dissertation Project Summary

WOMEN OF COLOR FACULTY IN SCIENCE AND ENGINEERING: SUCCESSFULLY NAVIGATING THE PROMOTION AND TENURE PROCESS

PI: Dr. Ann Austin
Doctoral Candidate: Melissa Soto

Project Summary

The underrepresentation of tenured Black women and Hispanic/Latina faculty in the fields of science and engineering at public, predominately White research intensive universities is well documented. Women of color, in particular, cite additional obstacles beyond those reported for junior faculty and women in academia such as tokenism, microaggressions, and bicultural stress. Despite this, however, a small but growing number have achieved promotion and tenure in these fields. Yet, limited knowledge remains as to how or why the few tenured women of color who have successfully advanced their academic careers have done so.

This study focuses on individuals who achieved tenure in environments where teaching, research, and service are typically expected, and where grant and publication success are major currencies. The study examines what contributes to the successful advancement of their faculty careers from *assistant to associate* status, from the perspective of the women faculty themselves. Specifically, the strategies that US domestic Black women and Hispanic/Latina science and engineering faculty used to overcome personal, organizational, and disciplinary related challenges amidst the promotion and tenure process will be examined. Furthermore, the factors that enabled these scholars to persist through these challenges will be examined.

The study addresses this question: *What contributes to the successful career advancement of women of color faculty in the fields of academic science and engineering?* The sub-questions are:

a) What strategies did tenured Hispanic/Latina and Black women faculty in science and engineering enlist to successfully overcome personal, organizational, and disciplinary related challenges amidst the early career promotion and tenure process?

b) What factors enabled them to persist through these challenges?

This qualitative study is a multi-site study that is guided by a theoretical and conceptual framework informed by the faculty development literature, social cognitive theory, and literature on faculty of color, women of color, and faculty in science and engineering. The interview phase of this study will focus on speaking with *tenured* women of color faculty who achieved promotion and tenure at a predominately White, research-intensive university in a physical science, life science, or engineering disciplinary area.

Contact information:

Melissa Soto
Doctoral Candidate, Higher, Adult, and Lifelong Education
Michigan State University

Tel: [text removed]
Email: msoto1@msu.edu

This is a dissertation study in partial fulfillment of the requirements for the degree of doctor of philosophy; this study has been approved by the Michigan State University IRB Office (IRB# X13-072e).

My dissertation study is directed by my advisor, Dr. Ann Austin, Professor in the Department of Educational Administration at Michigan State University.

Dr. Ann E. Austin, P.I.
Professor, Higher, Adult, and Lifelong Education
419A Erickson Hall
Michigan State University
East Lansing, MI 48824
Tel: 517-355-6757
Fax: (517) 353-6393
E-mail: aaustin@msu.edu

Appendix G

Research Participant Information and Consent Form

You are being asked to participate in a research project. Researchers are required to provide a consent form to inform you about the study, to convey that *participation is voluntary*, to explain risks and benefits of participation, and to empower you to make an informed decision. You should feel free to ask the researchers any questions you may have.

Study Title: Women of Color Faculty in STEM: Successfully Navigating the Promotion and Tenure Process.

Primary Investigator: Ann E. Austin, Ph.D., Department of Educational Administration, College of Education

Address and Contact Information: 620 Farm Lane, Erickson Hall Room 419, East Lansing, MI 48824-1034, Email: aaustin@msu.edu, Telephone: 517-355-6757.

1. PURPOSE OF RESEARCH:

You are being asked to participate in this research study concerning the successful navigation of the promotion and tenure process by women of color faculty who are in the academic fields of science and engineering. Your participation will contribute to the knowledge surrounding understanding: the personal, organizational, and disciplinary related challenges that women of color science and engineering faculty encountered amidst the promotion and tenure process as early career faculty; the actions taken to overcome or mitigate those challenges; and what factors enabled their successful persistence that led to the achievement of attaining promotion and tenure. This study, entitled *Women of Color Faculty in Science and Engineering: Successfully Navigating the Promotion and Tenure Process,* is conducted by
Melissa Soto under the supervision of Dr. Ann E. Austin. Please note that if you are under 18 years old, you are not able to take part in this study.

2. WHAT YOU WILL DO:

Your participation would involve one interview (90-120 minutes). There is a possibility that I may ask you to participate in a second (optional), follow-up interview (30-60 minutes). Thus, your total time commitment would be up to approximately 3 hours should an optional follow-up interview ensue, or 90-120 minutes should only one interview be conducted. The interviews will be conducted in an informal, conversational manner with open-ended, semi-structured interview questions that allow you to talk about your experience candidly. You may agree to be digitally recorded, or you may choose not to be digitally recorded during our conversations. Your identity will be held in strict confidence. The first interview will be conducted via Skype. If this is not a possibility for you, a telephone interview may be conducted. The researcher will arrange for a private area on the researchers' end to review the consent form and to conduct the interview with you. The degree of privacy to review the consent information and to conduct the interview via Skype and/or phone on the participant's end is up to the participant. The researcher will have little control over the area or level of area privacy for the participant, pending the location that the participant elects to conduct the interview from.

3. RISKS AND BENEFITS:
While participating in this study, you will encounter minimal risks, including the potential inconvenience of scheduling the interview and/or the possibility that anxiety or unpleasant experiences will surface during the interview. The researcher will minimize these risks. The benefits of participating in the study include the opportunity to reflect upon and articulate your experience as well as contribute to a broader understanding of how women of color successfully attain promotion and tenure by overcoming and persisting through challenges in their work context.

4. PRIVACY AND CONFIDENTIALITY:
Your confidentiality will be protected to the maximum extent allowable by law. Any direct identification information, including your name, will be removed from data when responses are recorded and analyzed. All data will be password protected and secured in locked file cabinets. The data will be accessible only to the researchers associated with this study. Michigan State University Institutional Review Board may have access to unidentifiable data if an audit were performed. During analysis, numeric codes will be assigned to your information so that your name is not associated with the data files.

During dissemination, findings will be reported by theme (aggregating the data) or by pseudonym (assigning a fake name). The results of this study may be published or presented at professional meetings, but the *identities of all research participants and institutions will remain confidential.* Special care will be taken to ensure contextual details do not give away your identity. Although every attempt will be made to keep your identification private, some distinguishing responses that you share and other comments may reflect your identity. Should the researchers believe this to be the case, the researchers will contact you directly to obtain your permission to use any suspecting distinguishing response(s). You have the right to decline permission.

All data will be stored for at least 3 years after the project closes. Three years after the conclusion of the study, the data (digital audio files, transcripts, notes, data and documents related) will be destroyed.

5. YOUR RIGHTS TO PARTICIPATE, SAY NO, OR WITHDRAW:
Your participation is completely voluntary. You may choose not to participate at all, or to answer some questions and not others. You may also change your mind at any time and withdraw as a participant from this study with no negative consequences. Choosing not to participate or withdrawing from this study will not involve any penalty or loss of benefits to which you are otherwise entitled. Your responses or decision whether or not to participate in this study will have no penalty of any kind and will not affect your status as a faculty member.

6. COSTS AND COMPENSATION FOR BEING IN THE STUDY:
You will receive a modest compensation for participating in this study in the form of a $20 Amazon.com gift card. You will receive this gift card within 48 hours following full completion of your first interview. There is no compensation for the follow-up interview, should a follow-

Appendix G (cont'd).

up interview ensue. The follow-up interview is an optional aspect of my study design, and may or may not occur.

7. CONTACT INFORMATION FOR QUESTIONS AND CONCERNS:
If you have questions or concerns about this study, such as scientific issues, how to do any part of it, or to report an injury (i.e. physical, psychological, social, financial, or otherwise), please contact principal investigator Dr. Ann E. Austin at 620 Farm Lane, Erickson Hall Room 419, Michigan State University, East Lansing, MI 48824-1034, Email: aaustin@msu.edu, Telephone: 517-355-6757. The secondary investigator's contact information is: Melissa Soto, PhD Candidate, 57 Middlevale Road, Apt 1450 B, East Lansing, MI, 48823, Email: msoto1@msu.edu, Telephone: [text removed].

If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 207 Olds Hall, MSU, East Lansing, MI 48824.

8. DOCUMENTATION OF INFORMED CONSENT.
You are indicating your *voluntary participation* in this study and acknowledge that you may: 1) choose not to participate in the study; 2) refuse to answer certain questions; and 3) discontinue your participation at any time without any penalty or loss of benefits to which you are otherwise entitled.

After researcher and participant review this consent form together, by completing this interview and the optional follow-up interview, you are agreeing to participate in this research study.
I agree to having this interview and the optional follow-up interview taped, by stating "yes".

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