INCONGRUENT PATHS: THE DIFFERENTIATING IMPACT OF GENDER ON ROLE CONGRUENCE, IDENTITY, EFFICACY, AND CLIMATE PERCEPTIONS IN STEM CAREER PERSISTENCE

by

Lindsay Nicole Johnson

(Under the Direction of Gary Lautenschlager)

ABSTRACT

The study investigated the impact of gendered ideology, identity, efficacy, and climate on career persistence for women in the STEM industry. The study used role congruity theory to describe perceived disparity in congruence between gender roles for women and the role of 'scientist.' The study also investigated the importance of identity compatibility (compatibility between 'self' and 'discipline') on career persistence. Results indicated both role congruence and identity compatibility significantly predicted persistence. Women demonstrated significantly less role congruence (greater disparity perceived in two roles) compared to men, yet there appeared to be no significant difference between women and men in terms of identity compatibility. A partial mediator, efficacy was also investigated. Multi-group analyses revealed marginal support for the mediated model, where women demonstrated greater efficacy compared to men. Lastly, climate perceptions also significantly predicted persistence. In sum, congruence, compatibility, as well as efficacy offered insight into women's persistence in sometimes incongruent STEM career paths.

INDEX WORDS: Women, Career, Identity, Gender, Persistence,

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CHAPTER 1

INTRODUCTION

The gender disparity in science, technology, engineering, & mathematics (STEM) creates what has become a *cultural valuing* or acceptance of the male role in academe, often resulting in women's experiences to be invisible (Rosser, 1990; Rosser & Taylor, 2009). Women (as well as ethnic minorities) remain an untapped resource of human capital which could aide in building a thriving and much needed workforce that could strengthen America's economic vitality (Walters & McNeely, 2010). Recently, research has explored the barriers and challenges to equity that women continue to encounter. Many of these remain structural in nature (e.g. lack of critical mass of women) while others seem to be related to social experiences (e.g. isolation) which impact and potentially sway women's overall persistence in STEM. Moreover, achieving gender equality seems to have more to do with prevailing cultural beliefs about men and women, the type of work and related industry whether it is congruent with cultural beliefs about gender, as well as the subsequent institutional practices and policies of organizations therein (Glick & Fiske, 2007).

Cronin & Roger (1999) describe the disproportionate underrepresentation of women as both *progressive* and *persistent* in that not only is there a significant decrease in women the further one moves up the pipeline, but also that this is the case despite policy-oriented and often well-intended interventions causing many STEM academic environments to remain largely male-dominated(NRC, 2009; NSF. 2004). This is the case despite the increasing number of women in higher education and despite the also increasing number of women earning their doctorates

(Sonnert & Holton, 1996; Xie & Shauman, 2003). Empirical evidence suggests that compared to men, women receive considerably less support, experience social isolation from their male peers, and advance at slower rates to leadership (Xu, 2008). As a result more women professionals are likely to experience a decline in job/career satisfaction and higher attrition rates (Settles et al., 2006; Valian, 2005). Such occurrences appear to describe the at times incongruent academic realities of women professionals, including those in graduate and professional study. These experiences potentially derail women's persistence, hindering the possibility of obtaining *critical mass* in many higher education STEM environments, and further perpetuating a male-dominated (and male appropriate) reality (e.g. Oakes, 1990).

The slow and gradual disappearance of women in STEM has been referred to as the leaky pipeline. The term *leaky pipeline* describes a cycle where women at different stages in their education *leak out* from more traditionally male-dominated occupations or fields (e.g. STEM) at a more significant rate than their male counterparts (Blickenstaff, 2005; Rosser, 2009). For example, when women enrolled in STEM disciplines change their majors prior to graduation, or perhaps when other women who ultimately matriculate with STEM degrees, but choose to select another field for their career/vocation. This phenomenon suggests women, who at one time aspired to have a career in these respective fields, did not achieve or fulfill their full aspirations or potential in these areas (Frome, Alfred, Eccles, & Barber, 2006; Seymour 1995). Further, it suggests there are factors within the STEM career path that facilitate men's achievement and persistence in ways (e.g. social valuing) which tend to provide less benefit for women students in comparison.

Settles, Jellison, Pratt-Hyatt (2009) describes the *masculinity* of stereotypes that continue to surround the landscape of STEM, where the male identity in STEM is socially and culturally-normed as the standard. Settles et al. (2009), refers to this as the *masculine worldview* of science. The masculine worldview prevails in notions held by men and at times women as well. Such influences of stereotypes are described as being the core of women's potential conflicts with dueling experiences of two identities: their gender and their STEM identity (Rosenthal et al., 2011; Settles, 2004; Settles et al., 2009). And though there are various other factors that continue to contribute to the gender disparity in STEM, a portion of the challenge appears to be due to the marginalization and bias women face in STEM environments (Rosenthal et al., 2011). Further, women encounter sensitivity to their identity that is made more salient by the male-dominated space in which they find themselves (Frome et al., 2006). Thus, a socio-cultural view affirms the role of the *males in STEM*, while simultaneously disadvantaging women who occupy a similar position. Therefore, within certain industries there appears to exist complex intersections for women in particular which include: a) ideology as it pertains to gender, b) the gendered construction of the industry itself (as defined by norming socialization practices), and c) the identity of those seeking to enter the industry. Specifically, the unique intersections at which women find themselves is a *cross-roading* reality that narrowly defines much of the vocational/career landscape for women in science.

Therefore, the pipeline problem is perhaps more dynamic than previous understood. And although some underlying factors which tend to influence women's career persistence in STEM remain unclear, it is apparent more systematic influences such as a *masculine worldview* of science tends to privilege men and their STEM status and undermine women (Rosser, 1990, 2009). Thus, the goal of this study is to evaluate STEM environments and their impact on women's career choice.

This study will explore the following factors hypothesized to be important in women's persistence in STEM career paths: 1) role congruence or the perceived disparity between gender and work roles (e.g. women scientists); 2) identity compatibility or the perceived compatibility with one's self and their field of industry (e.g. major); 3) career efficacy; 4) and finally the impact of climate perceptions on career persistence. Differentiating the role of such factors on women's persistence in STEM is critically important to identifying what propels or deters women's ultimate career decision. Understanding factors that deter women from choosing academic career paths in STEM is also necessary to tackling the pipeline problem. This investigation appears to be critical to challenging persistent gender inequity in the academy as well as to building a greater sense of collective agency for women in STEM specifically.

CHAPTER 2

LITERATURE REVIEW & HYPOTHESES

Role Congruence Theory: Background

Expectations about the actual vs. the ideal behaviors of women and men have long occupied the psychosocial backdrop of a historically patriarchal society. Social role theory (Eagly, 1987) argues that there has been significant societal and cultural *consensus* regarding the expected behaviors of women compared to men. These expectations are often to women's disadvantage yet assumed to be appropriately descriptive and therefore prescribed to women vs. men accordingly. These expectations also represent the basis for which social identities are formed (Tajfel & Turner, 1979) and inform social and cultural norms which tend to render women powerless.

Social roles can be described as socially-shared expectations which apply to individuals who occupy a particular position or are members of a certain social category (Biddle, 1979; Eagly, 1987; Eagly & Karau, 2002). Therefore, *gender roles* specifically are consensual beliefs about the attributes (and behaviors) of women and men. It is suggested that these beliefs are also "normative in the sense that they describe qualities or behavioral tendencies that tend to be desirable for each sex" (Eagly, 1987, pg. 13). In addition, important in social role theory are two kinds of expectations or norms. Cialdini & Trost (1998) used the terms *descriptive* and *prescriptive: descriptive norms* being expectations about what a group of people actually do (e.g. stereotypes), and *prescriptive norms* which are expectations about what members of a group should or would ideally do. With respect *descriptive* and *prescriptive* norms, it is believed each sex possesses typical and divergent traits and behaviors associated with them (Diekman & Eagly, 2000; Eagly and Karau, 2002). For example, the cultural stereotypes of a *scientist* continue to be gender-normative or consistent with prescriptions for men (e.g. rational, single-minded), while remaining inconsistent with gender-normed prescriptions for women (Barbercheck, 2001). Briefly, it would seem the scientist identity is a male privileged identity that works to the advantage of males in STEM. Further, research also shows as behaviors become more differentiated based on sex, people tend to judge them as also being increasingly more appropriate for *only* one sex. This serves to provide the strongest basis for categorizing people (more than race) (Eagly & Karau, 2002) and as a result causes stereotypes of women and men to become easily and automatically activated (Banaji & Hardin, 1996).

Subsequently, the presence of *automatically activated* stereotypes creates what has been thought as the gender ideology (or gendered construction) of certain fields (Eagly & Karay, 2002, Reskin, 1993). This type of gendered ideology sets the parameters and allows women to have value in some professional or vocational industries and undervalued in others. The social and *cultural undervaluing* of women in certain roles as compared to men has become the perpetuating influence of the apparent division of labor, based on gender (Reskin & Roos, 1990; Reskin, 1999). For example, though women who currently make-up about 61% of the labor force according to the U.S. Department of Labor (2010), women still perform the majority of domestic work, and have remained concentrated in traditional occupations and *support* roles (e.g. secretary, administrative assistant) (Bianchi, Robinson, & Milkie, 2006; Koenig, Eagly, Mitchell, & Ristikari, 2011). In addition, former research has asserted a *segregation code* exists and prohibits mixing sexes as equals, having significant affects on the occupational path of both men and women, especially within industries typically thought to be reserved for men (Bergman, 1986). A critical implication here is cultural norms about expected gender roles remain imposing factors in occupational choice and influence women into traditional career paths vs. non-traditional (e.g. STEM).

In addition, gender ideology and the construction of gender in particular industries or disciplines requires answering the question, what is 'gender-appropriate? How is this socialized? And how does this become relevant in professional or employment contexts? Rhoton (2011) indicated that *professional socialization* into particular organizational/institutional cultures (e.g. scientific) tended to encourage and reward practices that inevitably maintained gendered barriers such as *social distancing* and *isolation* for women in male-cultured fields. Further, gender role stereotypes tended to elicit notions about *appropriate* workers and *ideas* about appropriate lines of work for social groups, especially as it pertained to science (Rhoton, 2011). As a result, monocultural dominance in certain fields (and the lens by which we view them) imposes sets of masculinized expectations (or masculine ideology) which limits the acceptable behaviors and demeanors of professional scientists (Murray & Syed, 2010; Rhoton, 2011). These expectations also construct 'normed' identities by which scientists and other professionals are often evaluated, posing professional challenges for women who possess a dissimilar identity (Rhoton, 2011; Etzkowitz, Kemelgor, & Uzi, 2000). For example, in gendered professions such as STEM, women are often perceived as honorary men or flawed women and left with minimal choices such as choosing to act like men in order to be successful, leave the industry if they cannot adapt to the culture, or remain in the industry in a support or unimportant role (Powell, Bagihole, & Dainty, 2009). Further, the manner in which gender is reproduced daily (via institutional policies or events) and performed (as in 'done' or 'undone') reinforces traditional gendered ideals and norms in organizational structures and cultures (Powell et al., 2009).

Eagly and Karau's (2002) role congruity theory seeks to describe such conflicting realities. It specifically speaks to the conflicting goals, perceptions, and behaviors between one's specified role and society's stereotypical notions of gender. R*ole congruity theory* considers the congruity between gender roles and those pertaining to *gendered* professions or those that are uniquely perceived as being more appropriate for one sex vs. the other. Eagly & Karau (2002) examined positions such as Executive officers, and senior-level managers, where the incongruity of roles seemed to occur often as a result of the nontraditional space women occupy. In the present study, role congruence is specifically explored as it relates to fields of science, technology, engineering and mathematics. It is expected that the role of 'scientist' will elicit a similar disparity between women and the role of scientist. Thus,

H1: *Women will perceive less role congruence or a greater disparity between the role of 'scientist' and 'women' compared to men.*

H1a: *The relationship between role congruence and career persistence will be stronger for women compared to men.*

Identity Compatibility & STEM

For women, in many countries including the U.S., social stereotypes remain particularly salient in both social and academic contexts. Rosenthal et al. (2011) described identity compatibility as women's belief that being female inherently conflicts with their STEM discipline. Rosenthal et al, (2011) further suggested perceived identity incompatibility can be an impediment to sustained achievement and engagement in pursuing a STEM career for women. Further, they demonstrated that perceived identity compatibility, along with social support significantly predicted belonging such that women who perceived greater compatibility also felt a greater sense of belonging in their STEM major.

Research suggests women who perceive incompatibility also experience heightened stress, often doubt their ability to perform, tend to develop negative achievement expectations, and can ultimately report lower actual performance (Settles, 2004). In addition, Settles et al. (2009) found evidence that greater perceived identity interference among women scientists (in the U.S.) was associated with higher levels of depression as well lower levels of performance. Thus it is suggested that perceived identity compatibility can potentially have profound effects on women's psychological well-being and engagement in STEM, especially in circumstances where feelings of doubt can be stirred or threat is perceived (Steele, 1997; Settles, 2004). Alternatively, with greater identity compatibility, it allows women to freely pursue their STEM career without the psychological stress associated with identity conflict.

In comparison to role congruity which is based on social role theory and describes the extent to which stereotypical perceptions and beliefs about certain social roles are affected by common notions of gender. Identity compatibility, based mostly on social identity theory (Hogg & Abrams, 1988; Tajfel & Turner, 1979) suggests people develop multiple nested identities (e.g. professional identities) based on their group affiliation, and certain contexts (e.g. STEM courses) elicit thoughts and behaviors consistent with these identities (London, Downey, Bolger, & Velilla, 2005). In further comparison, role congruity is based on a *cultural consensus* regarding gender roles and as a result reflects the *appropriateness* at which they occupy those roles, which can persuade women into some occupational roles and men into others. On the other hand, identity compatibility is described as being nested or internally *locused* and has to do directly with personal identification with being female (i.e. those who gender or being female is less central to their identity may not experience conflict or incompatibility to the extent of others) (Rosenthal et al, 2011). In this study it is believed an external societal projection appropriate gender roles (role congruity) is subtly different from the extent to which women themselves have internalized such projections (identity compatibility). This may make some sense given literature related to the personal group discrimination discrepancy. The personal group discrimination theory suggests that members of low status (underrepresented or marginalized in some way) groups typically report that their group experiences more discrimination than they do personally. For example many women may readily acknowledge that women as a whole have been discriminated against (in the workplace, wage/salaries, education, etc). However, to a surprise women rarely acknowledge that they have personally been discriminated against (Fuegen & Biernat, 2000). This is recognized as the discrepancy and believed to share some similarity with the differences in measures of role congruence versus identity compatibility.

It is expected that role congruence and identity compatibility will be correlated as they are both expected to be exogenous variables that directly impact persistence. Though, potentially highly correlated measuring both will be used to differentiate the degree to which identity and role congruence are comparatively different between women and men.

It is expected that this is case for women participants in this study. It is expected identity compatibility will influence career persistence STEM, and this will be significantly stronger for women.

H2: *Women will perceive less identity compatibility between their self and their STEM identity compared to men.*

H2a: *The relationship between identity compatibility and career persistence will be stronger for women compare to men.*

The Mediating Role of Efficacy

Another potential factor in women's STEM career persistence is their internal belief that they are indeed capable of being successful. Bandura's (1977*a,b*) social learning theory in layman's terms describes *efficacy* as self-confidence towards learning, and suggests that people are more likely to engage in behaviors and tasks in which than believe they are capable of being successful, and less likely to engage in tasks in which they feel less competent. Further judgments of self-efficacy also determine how much effort people will expend to master challenges and ultimately how long they will persist when facing adverse obstacles or challenges (Bandura, 1986). Specifically, self-efficacious students "work harder, persist longer, and have fewer adverse emotional reactions when they encounter difficulties than do those who doubt their capabilities" (Zimmerman, 2000, p. 86).

Furthermore, Zimmerman, Bandura, and Martinez-Pons (1992) found that self-efficacious students, typically judging themselves to be more capable, also embraced more challenging goals. For women, pursuing a major in STEM due to their own efficacious beliefs, could well represent a more challenging goal and those who opt for this path may also possess a greater sense of efficacy. Research has indicated that self-efficacy measures correlate significantly with student's choice of majors, relevant success in their coursework, and their subsequent persistence (Hackett & Betz, 1989; Lent, Brown, & Larking, 1984; Zimmerman, 2000). Efficacy in this case is a means to not only motivate, or self- regulate one's learning process or choices of learning activities (e.g. major), but it is also strategy use. Efficacious beliefs or judgments motivate students' use of learning strategies, and the greater motivation to self-regulate learning via the use of strategies also produces higher *academic achievement* (Multon, Brown, & Lent, 1991). Further, Multon et al. (1991) found that self-efficacy accounted for approximately 14% of variance (overall effect size .38) in students' academic performances across a variety of criterion measures. These results help to validate the role self-efficacy plays in promoting persistence and enhancing achievement (Zimmerman, 2000). In addition, these results demonstrate potentially critical implications for women in STEM considered as highly self-efficacious (greater sense of efficacy) than those who are not.

Unlike other measures of self-beliefs, which are trait-like and believed to be stable over time, efficacy is assumed to be responsive to changes in context, personal experiences, and outcomes. Explicitly, successes raise mastery expectations, and repeated failures lower them particularly if they occur early in the course of events (Bandura 1977*b*, 1986). With regards to STEM, it has been suggested that even as early as secondary school, the experiences of women in areas of science and math tend to influence their overall perceptions of not only the discipline itself but also their ability to succeed as a contributing member to the respective discipline(s) (Eccles & Blumenfeld, 1985; Eccles (Parsons), Adler, Futterman, Kaczale, Meece, & Midgley, 1985). Self perceptions of ability and expectancies of success in science and math have been found to be significantly related to intentions to take future math and science courses, number of courses taken overall, as well as aspirations to pursue a career in math or science (Eccles (Parsons) et al.,1985; Frome et al., 2006). This is especially the case for women, as females tend to underestimate their abilities in the math and sciences, even when objective scores show little to no difference in ability (Hackett & Betz, 1989).

In an industry not often socialized as gender congruent, there appears to be an imperative role for different efficacious experiences or quality moments in STEM atmospheres. For example, Sadler, Burgin, McKinney, and Punjuan (2010) studies of research apprenticeships found research experience also enhanced attitudes including interest in science careers and increased self-efficacy regarding overall research skills (often critical to STEM disciplines). In addition, enrichment or retention programs have been noted as being important to building efficacy of women in STEM. Nave, Frizell, Obiomon, Cui, and Perkins (2006) investigated the academic performance and graduation rates of women enrolled at a historically black college/university (HBCU) who participated in a NSF-sponsored STEM enrichment program, and found that this group of women performed better than their male peers in their first-year of coursework. Villarejo & Barlow (2007) also evaluated members of an educational enrichment program for underrepresented biology majors and found that members of these programs outperformed others in general chemistry and calculus as well as persisting in graduation with their biology major. Research suggests these programs are critical spaces of support for women and allow them to further validate their identities as *scientists* enhancing perceived self-efficacy (Ong, 2002). Thus, these experiences play a significant role in affirming underrepresented student's identity and promoting self-efficacy and seem particularly important to women's persistence in STEM.

Former research has also demonstrated the significance of other sources of efficacy as well. These aides tend to come from witnessing others perform threatening activities without adverse consequences and when successful, it generates a sense in observers they can also be successful should they persist in their efforts. Such aides are also often achieved by securing quality relationships. Research indicates relationships (e.g. peers, faculty, family supporters) have a particular influence for women in STEM. This may be the case, as women attempt to thrive in monocultural environments, women will seek out both academic and personal relationships vigorously in order to build their confidence and strengthen their learning in STEM majors (Ong, Wright, Espinosa, & Orfield, 2011). Ong et al. (2011) also indicates maintaining these relationships provide a means to ensure that women stay determined and on course to graduate. Of the more important types of relationships are those that come in the form of mentors or role models. The role of mentors has been cited as vital to women in nontraditional fields

(Burlew & Johnson, 1992; Ong, 2002). The mentoring role can be occupied by a various group of influences, such as faculty, family members, peers, or current employers. Because of the current demographic representation in STEM environments, securing positive mentorship becomes a challenge and mostly mentors tend to be male and White (MacLachlan, 2006; Ong et al., 2011). However, exposure to female STEM experts promoted positive implicit attitudes and greater implicit identification with STEM (Stout, Dasgupta, Hunsinger, & McManus, 2011). Stout et al. (2011) found this was predicated upon a greater self-efficacy, due to the subjective identification and the connectedness they shared with these like-individuals. Overall, women's self-concept benefitted significantly from contact with the female experts and enhanced their commitment to pursue STEM careers. Essentially if women believe there is a place for women in STEM, and that other women have established a collaborative identity between their selves and STEM, then they too can also.

Other instances where efficacy has become apparent to persistence involve relationships with family, as well as those in the community. Sosnowski (2002) found evidence that family members' efforts to reinforce values and principles of resilience were credited by African American female doctoral students as being an emotional tool to promote their careers in STEM. Further, research has shown women of color in particular tend to play a persuasive role in outreach and actively recruiting other minority females into STEM (Ong, 2005). These potential encounters represent moments where necessary or provisional advice can be offered to women in particular who are attempting to evaluate their own self-efficacy in a STEM environment. Thus, for women these types of evaluations can occur at every point of their decision to pursue a STEM career and receiving advice from other in-group members who are going through the process typically serve as a benefit.

Given the breadth of evidence as it concerns the impact of efficacy on women in fields of science, it is expected that efficacy will also be particularly important for women in the current study. It is expected that efficacy will partially mediate the relationship between role congruence and identity compatibility and career persistence. Additionally, it was expected greater efficacy would produce more favorable inclinations towards persistence in STEM, thus,

H3: *Efficacy will partially mediate the relationship between role congruence and identity compatibility and career persistence in STEM.*

The STEM Environment & Climate Perceptions

Relational demography (Tsui, Egan, & O'Reilly, 1992) proposes that diversity-related outcomes (e.g. climate perceptions of those in the minority) are effectually contingent upon the demographic make-up of the larger group relative to the perceiver (Avery 2003). In addition, strong demographic faultlines (Lau & Murnighan, 1998), where subgroup categorization (i.e. more women in support roles in STEM) is particularly poignant and the relevant size of one group is significantly smaller than the other (i.e. women vs. men) generates a disparity in subgroup power. The presence of fewer subgroup members, and the positions in which they primarily occupy (tokenism), causes increased perceptions of a lack of social power, and suggests less internal support potentially leading to reduced confidence in group members (Lau & Murnighan, 1998). Further, higher perceptions of similarity tend to elicit more favorable responses towards climate by the perceiver including: interpersonal attraction, perceptions of fairness, and increased satisfaction (Riordan & Shore, 1997; Tsui et al., 1992). Due to the demography in STEM environments and the underrepresentation of women compared to men, it would make sense that decreased perceptions of similarity between the STEM group at large and women, who represent the perceiver, exist. Moreover, research indicates that such perceptions carry a heavy weight in the assessment of STEM climates by women.

Brown (2000) conducted a large survey and found that interpersonal relations including isolation, racism, sexism, ethnic identity, and also relationships with both faculty and peers, caused more difficulty for women, specifically women of color, than did structural barriers such as financial aid, recruitment practices, faculty composition, research funding and support. Additionally, Brown (2000) and Maclachlan (2006) found that the cultural belief in the prevailing White male superiority in the STEM disciplines manifested as *microaggressions* in some of the everyday practices of STEM programs, causing minority women in their respective studies to feel judged as intellectually inferior and resulting in their social isolation and their rejection from peer (usually male) study groups. This type of interpersonal discrimination or prejudice has been recently described as *incivility* in research (Cortina, 2008). Cortina (2008) discusses *incivility* as a subtle form of interpersonal discrimination or prejudice and often the more prevailing form of discrimination in organizations as well as higher education. Further, she refers to *selective incivility* as being more than general incivility or subtle prejudice, but rather incivility based on individuals being members of socially undervalued groups, primarily gender and race. Thus, women in STEM who represent the minority can encounter interpersonal discrimination that is targeted directly at their own identity.

Settles, Cortina, Stewart, & Malley (2007) investigated potential obstacles that examined the negative impact of sexist climates for female tenure-track faculty in science. They found that women scientists, who viewed their climate as more sexist or generally poorer and more hostile, were less satisfied overall with their jobs than those who viewed the climate as less negative. Further, sexist climates specifically, influence satisfaction by increasing the perceived likelihood of sexist or discriminatory behaviors to take place (e.g. future expectations). It is apparent that women in male-intensified environments such as STEM, where gender is hyper-salient, may make a more negative or poor assessment of their work climate based on potentially negative experiences.

Berdahl (2007) described sexual harassment unique to women in male-dominated spaces in particular. This type of harassment does not stem from sex or sexual desire, but rather is employed as a means to reposition *uppity women* (e.g. women scientists) to their place. The term *place* here describes a role that is more female-appropriate (e.g. less male-dominated) based upon social ascriptions and expectations of women and men's work roles or academic pursuits. Further, women who violate these gender-stereotypic prescriptions are more subject to face these forms of social, cultural and even professional penalties (Heilman, 2001; Settles et al., 2007). In addition, evidence has suggested that sexism and sexist climates impact women's perceptions of their work environments (Glick & Fiske, 1996, 2001).

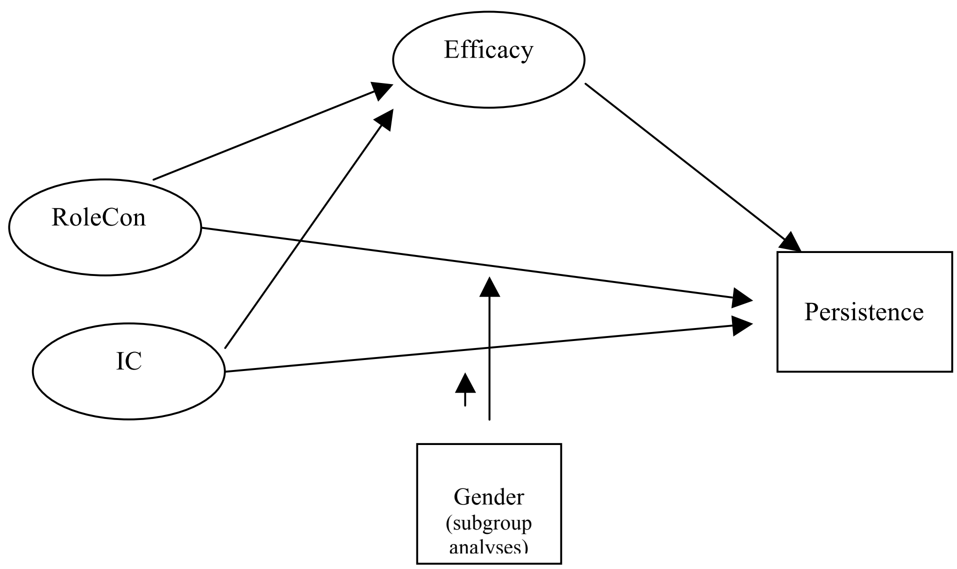
Further, the STEM environment in general has often been described as *chilly* or uninviting for women professionals due to a culture of science that continues to be biased (Settles et al., 2007). In addition, a dearth of women faculty makes it challenging to secure the support of mentors/role models and a general sense of affirmation that the STEM environment is one in which women can thrive. Further, low proportions of women may send the signal to other women that the discipline is unattractive to women, and that it should be avoided (Settles et al., 2007). Thus, it is understood that the only way to infiltrate these professions is by acting similar to their male colleagues. As a result, women may desire less to be a part of such male-intensified environment, and the challenge of encouraging women's persistence becomes quite difficult.

It is expected that the STEM environment will elicit more negative climate perceptions for women than men. It is also expected that climate perceptions for women influence their intentions to persist in their STEM career paths.

H4*: Women will have more negative perceptions of climate than men.*

H4a: *Climate perceptions will more strongly affect career persistence in STEM for women compared to men.*

<u>Proposed Model</u>: (Note: climate perceptions tested in separate analyses)



CHAPTER 3

METHODS

Sample

A network of STEM graduate students and colleagues at a large southeastern university were targeted via a snowball method for participation in the study. It was expected that this method of sampling from various STEM disciplines would produce a larger N, as well as establish variability in responses. Thus, the network also included STEM discipline graduate coordinators who were asked to forward the survey to the students in their respective departments (participants were subsequently asked to forward along to their peers). In addition, participants were targeted using social media sites such as Facebook and LinkedIn. A total of 259 participants responded to the survey. Of the 259 individuals only 229 completed the survey and provided information related to gender (indicating male, female). Post-hoc power analysis using program G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) using, $\alpha= .05$, two-tailed, and an effect size $f^2 =.04$ revealed power $(1 - \beta) =.76$. The sample consisted of 60.7% women and 39.3% men and had an average age of 28.45. Approximately 56.7% of participants were White/Caucasian, 34.0% Black/African American, 6.2% were Asian, and about 3.1% indicated Latino/Hispanic and Other. Additionally, 18.1% indicated they were first generation students, majority 81.9% indicated they were not. Graduate majors/programs of study included: Statistics, Biology, Biochemistry, Biomedical/Mechanical Engineering, Chemistry, Computer Science and Physics, Agricultural Science. Represented in the sample, 23.8% were Biological Sciences majors, 18% Psychology/Neuroscience, followed by 17.2% Natural/Applied Science, 14.8%

Computer Science/Engineering, 10.7% Mechanical/Electrical Engineering, 9.8% were Mathematics/Statistics, 4.1% were Physics, and 0.8% indicated they were Chemistry and Biomedical Engineering/Material Science majors respectively.

Procedure

Participants were recruited to participate in the main study via an online survey, where respondents participated on a voluntary basis. By clicking on the survey link in the email, respondents provided their consent to participate. Participants responded first to demographic information. Participants also provided information about the demographic make-up of their respective program. Participants then responded to several measures evaluating their identity, efficacy, climate perceptions, and career persistence. Participants responded to items assessing role congruence of women in science. Participants then responded to an identity compatibility measure (a graphical measure consisting of gradually overlapping circles used to describe their perceived relationship between their self, and their major; Rosenthal et al., 2011). Participants also answered items related to career self-efficacy. Participants were asked questions related to climate (negative vs. positive perceptions) and the degree to which climates in their departments were for example, collegial, respectful, competitive, or supportive (Settles et al., 2007). Finally participants responded to career persistence items.

Measures

Role Congruence. Role congruence was measured using a measure developed by Peters, Terborg, and Taynor (1974) and subsequently adapted by Eagly & Karau (2002). The 'Women as Managers' scale has been widely used and contains items such as "*It is not acceptable for women to assume leadership roles as often as men," "Women cannot be assertive in business situations that demand it," "Women are less capable of learning mathematical and mechanical* *skills than are men,"* and *"Women are not ambitious enough to be successful in the working world."* The scale consisted of 21 items scored on a 7-point Likert Scale (*strongly disagree-strongly agree*). The higher the score, the greater the perceived disparity between the performance evaluation differences of managerial men and women. The former scale was based on perceived differences that tended to indicate a general perception of the role of leader as masculine. In this study, it is asserted that the role of a scientist is also perceived as mostly masculine. For this study, this scale was framed toward 'women as scientists' vs. 'women as managers'. Tests for reliability revealed Cronbach's alpha for role congruence, α=.89.

Identity compatibility. Identity compatibility between STEM major and self was measured using a pictorial measure, the "*Inclusion of Other in the Self"* measure, adapted by Rosenthal et al. (2011). This measure assesses the compatibility or integration of relationships (Aron, Aron, & Smollan, 1992) and has been applied to a variety of contexts subsequently. The measure includes one item and has demonstrated adequate test-retest reliability and convergent validity similar to some lengthier measures (Rosenthal et al., 2011). Graphically the measure uses a pair of progressively overlapping circles (i.e. venn diagram), and participants are to choose out of seven choices which best represents their compatibility between their self and STEM major (each represented by one of the circles). The measure was expected to be more relevant for women compared to men. It was not expected that identity compatibility would be particularly relevant for men (meaning men will more than likely view their identity and STEM discipline as largely compatible). It was expected that higher scores (indication of greater compatibility) would predict greater career persistence.

Career Efficacy. Efficacy was measured using a career self-efficacy scale adapted by Bolat, Bolat, & Kilic (2011) (alpha = .844). The scale is a 5-item modified measure based upon

Schwarzer, Mueller, and Greenglass (1999) earlier measure. Items were scored on a 5-point Likert scale (5 = "strongly agree" to 1= "strongly disagree"). Higher scores on this scale are associated with perceptions of higher career self-efficacy. Tests for reliability revealed Cronbach's alpha for identity compatibility, α=.85.

Climate Perceptions. Climate perceptions of respective programs were measured using an adapted scale from Hurtado (1998) later modified by Settles et al., (2007). Their version of the scale was adapted from a climate survey (Hurtado, 1998) and used a 5-point differential semantic scale to assess climate perceptions (alpha=.89). In this scale, pairs of descriptors represent labels for the poles of the scale and participants rated their departments on the following six dimensions: friendly-hostile, disrespectful-respectful, collegial-contentious, collaborative-individualistic, cooperative-competitive, and not supportive-supportive. These items were scored and reverse coded as appropriate, such that higher scores should indicate a more *negative* departmental climate. It was expected that women would have higher scores (more negative) on climate perceptions compared to men. Tests for reliability revealed Cronbach's alpha for identity compatibility, α=774. For exploratory purposes only, participants responded to items to assess the extent to which they perceive themselves a token in their environment. *Perceptions of Tokenism* was measured using 10 items adapted from Karrasch (2003) measured on a 4-point Likert scale. Example items include "*I receive a disproportionate amount of attention or scrutiny from my peers," or "I feel that I do not fit or belong with my peers."* Tests for reliability revealed Cronbach's alpha for tokenism, α=.81. The extent to which participants actually represent tokens in their academic department was assessed using Kanter (1977) standard which stipulates a token exists when 15% or less is comprised of members of your same group. Participants were asked the following two items: *Of those in your work group _ % are of the* *same gender: 0-10%, 10-20%, 20-30%, over 30%, and Of those in you work group _% are of the same race: 0-10%, 10-20%, 20-30%, over 30%.* This was also expected to yield information that offered some insight to the relational demography of represented disciplines. (Note: in oversight this item was not amended prior to analyses, and should have read 0-10%, 10-15%, 20-30%, over 30%)

Career Persistence. Career persistence was measured using a modified version of Blau (1985, 1988) measure of career commitment: defined as one's attitude towards one's profession or occupation (α=.87, .85). Blau's 7-item measure was specific to the nursing profession. This measure was later modified by Aryee (1993) who used the 'engineering' profession instead of 'nursing' (α=.85). Example items included, *"If I could do it all over again, I would choose to work in the STEM profession," "If I had all the money I needed without working, I would probably still continue to work in the STEM profession."* These items were combined with resilience items from Carson and Bedian (1994) measure of career commitment in IT professions based on three sub-dimensions: career identity (establishing a close emotional associated with one's career) (α=.94); career planning (determining one's developmental needs and setting career goals) (α=.95); career resilience (resisting career disruption in the face of adversity) (α=.94). Items assessing career resilience: *"Given the problems I encounter in the IT profession, I sometimes wonder if I get enough out of it," "Given the problems in the IT profession, I sometimes wonder if the personal burden is worth it," "The discomforts associated with the IT profession, sometimes seem too great,"* were used and adapted to read "STEM profession," respectively. Thus, a total measure of 10-items, using the terms "STEM Profession," was used to measure career persistence of participants. Items were scored on a 1 to 7 (Strongly Disagree to

Strongly Agree) Likert Scale. Tests for reliability revealed Cronbach's alpha for career persistence, α=.89.

For exploratory purposes, participants were also asked the following items: *How likely are you to pursue a lecturer/teaching faculty position in your field, upon graduation? How likely are you to pursue a tenure-track/research faculty position in your field, upon graduation?* Participants responded to these items using a 7-point Likert Scale (Strongly Agree-Strongly Disagree). Participants also indicated the desired amount of responsibility of research in position post graduate school this item is based on percentage desired (up to 100%).

CHAPTER 4

RESULTS

Means, standard deviations, and correlations were conducted on all scale variables and can be found in Table 1. Scale and reverse coded items are reported in *appendices*. Regression analyses were conducted to examine the influence of variables: congruence, identity compatibility, and efficacy on the outcome variable: career persistence. In addition, subgroup analyses were conducted to test strength of relationships between men vs. women on these variables. The variable climate was investigated using a separate analysis of direct effect of climate perceptions on persistence. To account for missing data, mean differences and regression analyses were initially conducted excluding missing variables both PAIRWISE vs. LISTWISE. In this set of analyses, it was believed participants who responded to all variables would have provided more complete information, thus missing data was excluded using LISTWISE comparisons. Reported sample sizes for LISTWISE comparisons shows N= 199, where N=117 for females and N= 82 for males (this total N for example reflects those responses for which there were no missing values on the variable role congruence especially, which fewer participants responded to). Using two sample tests for proportions to test the H : P1=P2 of missing data for women vs. missing data for men revealed no sufficient evidence to conclude the missing data differed by gender suggesting regression analyses of those with complete data would not be biased on that bases, $z=1.538 < 1.96$, $\alpha=.05$. In subsequent analyses, to test the multi-group model (and presence of mediator) the full information maximum likelihood (FIML) approach (Enders & Bandalos, 2001) was used for treating missing data within the model. This set of analyses used the full Model N=229 to estimate model fit and is discussed in further detail in results.

Mean Differences: Role Congruence, Identity Compatibility, Climate Perceptions

Means and standard deviations by gender on all scale variables obtained are reported in Table 2. Mean differences on the variables congruence (Hyp1), identity compatibility (Hyp2), and climate perceptions (Hyp4) were examined on scale to investigate the presence if significant differences between men and women. T-tests revealed significant differences between men, (M=5.890, SD=.7858) and women (M=6.1408, SD=.6138) on the variable congruence, t(197)= -2.522, p <.05. Items 1, 3, 6, 7, 15, 16, 17, 18, 20, 21 were reverse coded and are attached in the Appendix. Higher scores on role congruence indicate perceived incongruity for the roles of 'women' and 'scientist.' Women demonstrated significantly higher scores on role congruence suggesting this disparity was perceived to a larger degree by women in STEM compared to men. This suggests partial support for Hyp1 that there would be greater incongruence between the role of women and scientist among women participants. In other words, women were more negative about role congruence 'women as research scientists' (WARS) in STEM than the men were about WARS.

In subsequent t-tests to investigate Hyp2, and Hyp4, mean comparisons on variables identity compatibility and climate revealed a lack of significant mean differences between women (M=4.34, SD=1.481) and men (M=4.09, SD=1.635) suggesting a lack of support for Hyp 2 that women experienced greater incompatibility between their self and their major t(197)= -1.152, p>.05, where women were higher in identity compatibility though not significantly so (the opposite of what was expected). T-tests also revealed a lack of support for Hyp4, where there appeared to be no significant mean differences in climate perceptions between women

(M=3.7692, SD=.81647) and men (M=3.6927, SD=.65936). Climate perceptions were measured using Settles et al (2007) scale which assessed negative climate perceptions, such that higher scores indicate more negative perceptions of climate. Items 1, 3, 4, 5 were reverse coded. In the case of the results, women reported higher mean values of climate (more negative) but this difference was not significantly different from that reported of men. These results can be found in Table 2.

Direct Effects and Product Analysis of Role Congruence and Identity Compatibility

Following mean comparisons, multiple regression analyses were conducted to investigate the effect of role congruence and identity compatibility on the outcome variable: career persistence. In the overall model, it was expected that both role congruence and identity compatibility would significantly predict career persistence. This was predicted to be more strongly the case for women compared to men (for example it was expected that the relationship would be stronger for women: greater disparity in role congruence decrease persistence, Hyp1). Regression analysis revealed an overall significant model, $F(2, 196) = 22.500$, $p < .001$, where 18.7% ($R^2 = .187$) of variability in career persistence is explained by the predictor variables role congruence ($\beta = .287$, $p < .001$) and identity compatibility ($\beta = .276$, $p < .001$). Both variables were significant predictors of career persistence, suggesting partial support for Hyp 1a, and Hyp 2a that congruence and identity compatibility both significantly influenced career persistence in STEM. Significant mean differences in role congruence initially suggested women who had higher scores (greater perceived incongruence between roles) and also tended to be lower in career persistence (M=4.8026, SD=.91232), compared to men (M=4.9817, SD=1.09264). However, the extent to which the relationships between role congruence and persistence and identity compatibility and persistence are stronger for women compared to men was investigated further via subgroup analyses.

Subgroup analyses were conducted using linear tests for slope and intercept differences. A set of regressions were conducted on split data indicating male versus female, regressing role congruence and identity compatibility on persistence. Results can be found in Table 3. Regressions would reveal that the variable role congruence was significant predictor of career persistence for both women (β=.268, p=.003) and men (β=.361, p=.000). The parameter estimates (coefficients) for females and males also shown in Table 3 suggest that congruence may be a stronger predictor of career persistence for men (B=.554) than for women (B=.471). Regressions revealed the variable identity compatibility was also a significant predictor of career persistence for women (β=.215, p=.017) and men (β=.366, p=.000), suggesting initially identity compatibility was also a stronger predictor for men compared to women.

To further compare obtained regression coefficients on both role congruence and identity compatibility (Hyp1a & 2a) for differences between males and females, the null hypothesis $\mathbf{H_o}$**:** $\mathbf{B_{fem} = B_{male}}$, where $\mathbf{B_{fem}}$ was the regression coefficient for females, and $\mathbf{B_{male}}$ the regression coefficient for males was tested. A dummy-coded variable **female**, was coded 1 for female and 0 for male in SPSS. This was used to create subsequent variables fmCon (product term of role congruence and the dummy-coded variable female) and fmIC (product term of identity compatibility and the dummy-coded variable female). The variable **female**, **congruence**, and **fmCon** were entered as predictors into the regression equation. This was followed by entering **female**, identity compatibility (**IC)**, and **fmIC** as predictors into a second regression equation. It was not expected that persistence for men would be influenced by perceptions of role congruence. In the first regression equation the term fmCon tested the null hypothesis, t(198) =-

.431, was not significant (p=.667), where the term fmCon provided the differences (slope for females – slope for males; **i.e.** B_{fem}**-**B_{male}) , and indicated the regression coefficient B_{fem} was not significantly different from B_{male}. In the second regression equation the term fmIC tested the null hypothesis. The t value, t(198)= -1.154 was not significant (p=.250), where the term fmIC provided the differences (slope for females – slope for males; **i.e.** B_{fem}**-**B_{male}) and indicated the regression coefficient B_{fem} was not significantly different from B_{male} in the second regression equation. Both tests reveal little support for slope difference between male and females on the variable congruence and identity compatibility. The subgroup analyses also investigated the presence of intercept differences between males and females on role congruence and identity compatibility. To test the hypotheses $H_o: a_{fem}=a_{male}$ for the predictor variables role congruence and identity compatibility, the dummy-coded variable **female** was used in the regression equations including the product terms to predict career persistence. The t value t(198) = .164, p=.870; t(198)= .476, p=.634, indicated little support for significant differences between intercepts for the variables role congruence and identity compatibility, respectively. Results revealed little evidence for differences in magnitude or strength between women and men on the relationships between role congruence (Hyp1a) and identity compatibility (Hyp2a) and career persistence. In addition, t-tests on the variable career persistence also revealed a lack of support for significant mean differences between women and men, t(197)=1.220, p>.05.

Direct Effects and Product Analysis of Climate Perceptions

Before testing the mediated model (Hyp3), the variable climate was investigated via a separate set of regression analysis. It was expected that results would indicate climate significantly influences persistence. It was expected that women would have more negative perceptions of climate compared to men, and more negative perceptions would subsequently decrease persistence (Hyp4a). Regression analyses revealed of those that responded to climate items, an overall significant model, $F(1, 197) = 14.396$, $p < .001$, where approximately 6.3% ($R^2 = .063$) of variability in career persistence was explained by climate ($\beta = .261$, $p < .001$). Subsequent analysis by group revealed climate was significant predictor of career persistence for both women ($\beta = .299$, $p = .001$) and men ($\beta = .231$ $p = .037$), initially suggesting climate might be a stronger predictor for women (B=.334) than men (B=.383). Regression coefficients were tested similarly to the variables role congruence and identity compatibility, to test the hypothesis, **H_o: $B_{fem} = B_{male}$.** The t value, $t(198) = -.252$, was not significant ($p = .802$), suggesting a lack of support for significant differences between regression coefficients, and that the relationship between climate and persistence was not any stronger for women compared to men. Tests of intercept differences, to test **H_o: $a_{fem} = a_{male}$**, also revealed a lack of significant differences between women and men $t(198) = -.032$, $p = .975$, further suggesting that overall climate may have been somewhat equally important to both women and men in this study.

Also, in relation to climate and for exploratory purposes only, for the variable perceptions of tokenism there were no significant differences between men and women ($p > .05$), where approximately more than half the participants indicated over 30% of those in their academic work group were of the same gender (67.8%) and race (50.5%), respectively. Thus, tokenism was also not a significant predictor of career persistence ($p > .05$).

Exploratory Analyses by Major/Discipline: Relevant Findings & Implications for Climate

Additionally, and to follow-up analyses as it related to climate, mean differences between women and men were also assessed across the various academic disciplines on the outcome variable career persistence. It should be noted only about 52% of participants (of N=199) reported or identified their respective majors or academic discipline (causing N in some categories to be relatively small). In addition, Chemistry and BioMedical Engineering/Material Science each only had one response and comparisons could not be made. Of the remaining only, Mechanical/Electrical Engineering suggested marginal significance for mean differences between women (M=4.00, SD=.294) and men (M=4.60, SD=.540), on career persistence, t(8) = 2.005, p=.80.

Upon further investigation, though there was a lack of support for Hyp2 indicating no significant differences between women and men on identity compatibility overall. However, analyses by discipline revealed in Mathematics/Statistics women (M=3.67, SD=.816) were significantly lower in identity compatibility compared to men (M=5.00, SD=1.09), t(10)= 2.390, $p<.05$. This was opposite of reported means overall where women demonstrated higher mean values in identity compatibility compared to men (though not significantly so). In addition, the significantly lower means for women in Mathematics/Statistics on identity compatibility, was antithetical in comparison to women in Biological Sciences who were significantly higher (M=5.17, SD=1.150) in identity compatibility compared to men (M=3.50, SD=1.434), t(26)= -.3.365, $p<.05$ suggesting some uniqueness in disciplines as it relates to women's experiences in STEM.

Also to note, though there was a lack of support for mean differences between women and men on climate perceptions (Hyp 4), analyses by discipline revealed significant mean differences between women (M=4.40, SD=.282) and men (M=3.53, SD=.230) identified as Physics majors on climate perceptions, t(3) =-3.806, $p<.05$. Results suggested women indicated more negative climate perceptions compared to men, demonstrating some evidence for differences in climate or culture by discipline not entirely captured by overall analyses.

These analyses and findings by gender and discipline prompted additional exploratory analyses investing the role of minority status and gender by discipline on model variables. Around 68% of participants provided their race. Of those who reported, data was coded as minority v. nonminority participants. A 2(Gender) x 2(Minority Status) factorial ANOVA on variables persistence, role congruence, identity compatibility, efficacy and climate indicated marginal effect for minority status (main effect) on the outcome variable persistence, $p=.076$ where minority females reported lower means for persistence compared to nonminority females, minority males, and nonminority males (though not significantly so). Results, also indicated marginal effect for gender on the variable role congruence, $p=.092$, where nonminority females reported higher perceived incongruity compared to minority females, minority males, and nonminority males (although not significant). The obtained results, although marginal in effect, suggested some investigation as it pertained to gender and minority status by discipline as well.

Exploratory univariate tests were conducted, using a gender x minority status x discipline design on model variables. Results did indicate a significant effect for minority status on the variable identity compatibility, $F(1, 73)= 6.095$, $p<.05$ where marginal means for minority participants ($M=3.698$, $SD=.272$) were lower in identity compatibility compared to nonminority participants ($M=4.512$, $SD=.207$). Results also indicated effect for the two-way interaction gender x major, $F(6, 73)= 2.368$, $p<.05$, where differences in reported identity compatibility between women and men differ across disciplines, for example, women and men in biological sciences versus women and men in mathematics/statistics and differences in identity compatibility respectively (Note: the effect for minority x major was marginally significant for identity compatibility, $p=.068$). Additionally, results offered preliminary evidence for a significant three-way interaction between gender x minority status x discipline, $F(2, 73)=3.376$,

$p<.05$. Post hoc analyses demonstrated a lack of significant differences between discipline groups ($p>.05$), perhaps suggesting any mean differences were somewhat close (It should be noted that there were again majors/disciplines that were not included in estimates of mean differences, for example, there were no self-identified minority male biology majors thus analysis of pertaining to interaction effect did not include estimates of this particular mean difference). These brief results which take into account major/discipline, although beyond the scope of proposed relationships in the current study, provide some evidence for the necessity to include such relationships in subsequent analyses and studies where relationships are predicted and/or estimated in further detail.

Multi-group Model Analyses: Tests Partial Mediation of Career Efficacy & Model Fit

To test Hyp3 (mediated model), the presence of partial mediation of the variable career efficacy on the relationship between role congruence and identity compatibility and career persistence, a multi-group (stacked) model of analysis women and men that would test the overall fit of the model, and the fit of the model with women v. men by group was used. It was expected that greater self-efficacy would increase persistence. It was also expected that efficacy will be particularly important for women in STEM compared to their male counterparts.

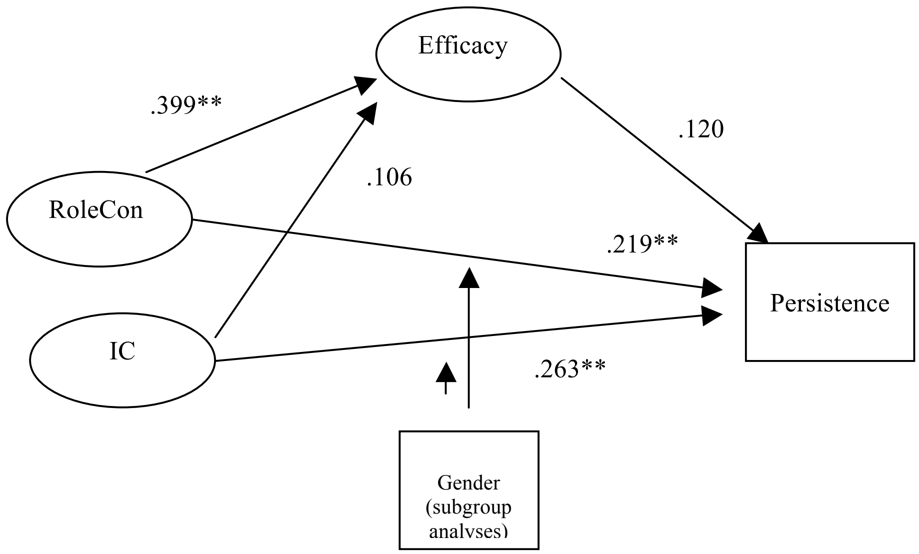
A test for the significance of the path model was conducted using Mplus software (Muthen & Muthen, 1998-2010). These results can be found in Table 4. Results in this portion of the analyses included data from the full model. Enders & Bandalos (2001) demonstrated full information maximum likelihood (FIML) is a superior method for dealing with missing data in structural equation modeling, where each parameter is estimated directly without first filling in missing data values for each individual. Further, FIML obtained estimates that were unbiased and considered more efficient (also yielded lowest rates of convergence failures and relatively optimal Type 1 error rates). Thus, to assess model fit, the FIML approach was used to account for missing data in multi-group analyses (N=229), as conducted by Mplus. Missing values were first coded, prior to running analyses.

The overall model analyses indicated role congruence significantly predicted persistence (β=.219, SE=.070, p=.002). Obtained positive coefficient here suggests greater perceived incongruity or incongruence predicted greater persistence. This was not expected in fact this is the opposite of what was expected, but may indicate some evidence for unique phenomenon related to women in STEM. Analyses also revealed identity compatibility significantly predicted career persistence (β=.263, SE=.061, p<.001), suggesting greater identity compatibility also predicted greater persistence. Results also indicated role congruence significantly predicted efficacy (β=.399, SE=.059, p<.001). However, results showed only marginal support for the path of career efficacy predicting persistence (β=.120, SE=.069, p=.081), and marginal support for identity compatibility predicting career efficacy (β=.106, SE=.062, p=.084). Overall model results also indicated only marginally significant results for the indirect of role congruence on persistence via efficacy (β=.048, SE=.070, p=.089). There was no mediated effect of identity compatibility on persistence via career efficacy (β=.013, SE=.010, p>.05).

Models analyses by group (female versus male as grouping variable) revealed both role congruence (β=.301, SE=.095, p=.002) and identity compatibility (β=.331, SE=.089, p<.001) predicted persistence for men. Results also indicated role congruence significantly predicted career efficacy for men (β=.272, SE=.106, p<.05), while identity compatibility did not (β=.118, SE=.102, p>.05). For women, group analyses indicated role congruence did not significantly predict persistence (β=.163, SE=.101, p>.05), yet analyses did indicate support for the variable identity compatibility on career persistence (β=.215, SE=.101, p<.05). Results indicated role congruence did significantly predict career efficacy for women (β=.477, SE=.072, p>.001). However, identity compatibility did not (β=.090, SE=.078, p>.05). Tests for indirect effects of role congruence on persistence via career efficacy revealed a lack of support for both women (β=.060, SE=.047, p>.05) and men (β.047, SE=.031, p>.05). Tests for indirect effects of identity compatibility on persistence via career efficacy also revealed little support for both women (β=.011, SE=.013, p>.05) and men (β=.021, SE=.021, p>.05). Model analyses by group suggested little support for differences in magnitude between men and women. Wald tests were subsequently performed to test the parameter constraints of the coefficients for relevant paths in the model.

To test the null (H_o) that the paths were the same, wald tests statistics of persistence on role congruence (value=.906, p=.3413), persistence on identity compatibility (value=1.294, p=.2554), persistence on career efficacy (value=.261, p=.6094), as well as efficacy on identity compatibility (value=.033, p=.8567) all indicated little evidence to reject suggesting that the paths of the model were similar in magnitude for men and women. The parameter statistic for the variable career efficacy on role congruence (value=4.140, p=.0419) indicated some support that the parameters for career efficacy on role congruence are different (rejecting the H_o), suggesting that this path differed between men and women. This may make some sense considering both predictor variable role congruence, and tested mediator career efficacy demonstrated (and were the only) significant mean differences between men and women in the study. In sum the overall model (males and females) provides some evidence for the significance of the model considering both groups together, and less evidence for differences in fit of the model by group (do not differ in magnitude). Tests for parameter constraints are reported in Table 5.

<u>Estimated Model</u>: (overall model including women and men)



Additional results investigating differences between women and men on questions assessing desire for research/tenure vs. lecture/non-tenure track positions did not reveal any significant differences between women and men ($p>.05$). There was only marginal significance in the case of percent (%) responsibility for research desired ($p=.092$). Analyses of demographic variables such as race, first generation, major, etc. also revealed a lack of significant differences and did not appear to impact career persistence.

Table 1: *Means, standard deviations and correlations for all respondents (women and men) on all scale variables*

Variable	M	SD	1	2	3	4	5
1. Gender	.587	.493					
2. RoleCon	6.037	.6990	.177*				
3. IC	4.24	1.547	.082	.177*			
4. Efficacy	4.406	.4873	.141*	.382**	.216**		
5. Persistence	4.876	.9918	-.089	.336**	.327**	.266**	
6. Climate	3.737	.7548	.050	.235**	.113	.021	.261**

*$p < .05$ ** $p < .01$, N = 199
Means for gender represent dummy coded variables; where for gender: males = 0, females = 1;

Note: RoleCon= role congruence, IC= identity compatibility; climate was tested in separate analysis from model

Table 2: *Results of t-tests analyses between men and women for proposed differences on variables*

	Gender			
	Female	**Male**	**t**	**p**
1. RoleCon	6.11408 (.61380)	5.8902 (.78584)	-2.522*	.012
2. IC	4.34 (1.481)	4.09 (1.635)	-1.152	.251
3. Climate	3.7692 (.81647)	3.6927 (.65936)	-.703	.483
4. Efficacy	4.4632 (.9131)	4.3244 (.47831)	-1.993*	.048
5. Persistence	4.8026 (.91232)	4.9817 (1.09264)	1.256	.211

*$p < .05$ ** $p < .01$, Female N= 117, Male N=82, Total N=199, df=197

Note: higher scores on role congruence indicate *perceived incongruity*; higher score on climate indicate *more negative perceptions* of climate; analysis of mean differences on the variables efficacy and persistence were conducted as follow-up

Table 3: *Results of regression analyses including subgroup analyses of predicted variables role congruence, identity compatibility, and climate on the outcome variable persistence*

		B (β)	S.E.	t	p-value (sig.)
(Direct effects)					
RoleCon		.407 (.287)	.093	4.388**	.000
IC		.177 (.276)	.043	4.220**	.000
Climate		.343 (.261)	.090	3.794**	.000
(by Group)					
RoleCon	Females	.471 (.317)	.131	2.356**	.001
	Males	.554 (.398)	.143	3.884**	.000
IC	Females	.170 (.276)	.055	3.075**	.003
	Males	.270 (.403)	.068	3.941**	.003
Climate	Females	.334 (.299)	.099	3.362**	.001
	Males	.383 (.231)	.180	2.127*	.037
(Product analysis)					
Female		.192 (.095)	1.166	.164	.870
RoleCon		.554 (.390)	.131	4.217	.000
fmCon		-.083 (-.256)	.192	-.431	.667
Female		.185 (.092)	.387	.476	.634
IC		.270 (.420)	.064	4.244	.000
fmIC		-.100 (-.244)	.086	-1.154	.250
Female		-.024 (-.012)	.738	-.032	.975
Climate		.383 (.292)	.162	2.371	.019
fmClim		-.049 (-.097)	.013	-.252	.802

*$p < .05$ ** $p < .01$, N=199

Table 4: Results for multi-group analyses including overall model and by group analyses (female v. males)

	Estimate (β)	S.E.	p-value (two-tailed)
(Overall)			
Efficacy			
RoleCon	0.399	.059	.000**
IC	0.106	.062	.084
Persistence			
RoleCon	0.219	.070	.002**
IC	0.263	.061	.000**
Efficacy	0.120	.069	.081
Indirect Effect: Persist			
RoleCon via Efficacy	0.048	.028	089
IC via Efficacy	0.013	.010	.219
(Females)			
Efficacy			
RoleCon	0.477	.072	0.000**
IC	0.090	.078	0.250
Persistence			
RoleCon	0.163	.101	0.105
IC	0.215	.084	0.011*
Efficacy	0.127	.096	0.186
Indirect Effect: Persist			
RoleCon via Efficacy	0.060	.047	0.193
IC via Efficacy	0.011	.013	0.387
(Males)			
Efficacy			
RoleCon	0.272	.106	0.010*
IC	0.118	.102	0.249
Persistence			
RoleCon	0.301	.095	0.002**
IC	0.331	.089	0.000*
Efficacy	0.174	.097	0.072
Indirect Effect: Persist			
RoleCon via Efficacy	0.047	.031	0.130
IC via Efficacy	0.021	.021	0.328

*$p < .05$ ** $p < .01$, Female N=139, Male N = 90, Model N=229

Table 5: Results for wald tests of parameter constraints of mediated model: by groups (females v. males)

	Value	***df***	***p-value***
1. Efficacy on Rolcon	4.140	1	0.0419*
2. Efficacy on IC	0.033	1	0.8567
3. Persistence on RoleCon	0.906	1	0.3413
4. Persistence on IC	1.294	1	0.2554
5. Persistence on Efficacy	0.261	1	0.6094

*$p < .05$ ** $p < .01$, Female N=139, Male N = 90, Model N=229

CHAPTER 5

DISCUSSION & IMPLICATIONS

Culturally speaking, science (fields related to science) is still often times regarded as *a boy's subject* and young girls even as early as adolescence are pushed in the opposite direction. Research suggests this cultural sentiment remains prevalent even in this new century (Seymour, 1995). This is perhaps the case due to the persisting cultural pressure for girls and women to conform to traditional gender roles which typically lie beyond the confines of the science industry. This study in particular sought to explore issues of role congruence and its impact on career persistence for women in STEM. This study also sought to further explore the challenge of identity compatibility (Rosenthal et al, 2011) and issues of efficacy both as potential influences on persistence.

The Influence of Role Congruence & Identity Compatibility

It appeared women and men differed on role congruence, with women experiencing a greater incongruence compared to men. These results draw some similarity to Eagly & Karau (2002), such that the role of 'women scientists' was seen as less congruent in terns of gender roles, especially for women. This finding may not seem surprising given that much of STEM (especially academia) continues to be monoculturally-defined by a prevailing masculine view and a largely male population. This finding also sheds some light on the importance of factors related to science *culture* in particular, as well as the persistent cultural valuing of men (or the male role) in science roles perhaps over or beyond women (Blickenstaff 2005, Cronin & Roger, 1999). This finding also offers real implications for departments in higher education, to further assess the extent to which they participate in enabling or perpetuating a value of men over women in science, or are proactive in deconstructing such social valuing by promoting policies and programs which aid women's progression in their respective environments. Cheryan, Plaut, Davies, & Steele (2009) demonstrated socially symbolic objects, or *ambient identity cues*, such as masculinity can be portrayed in an environment (e.g. via physical objects or structural layout) in ways that prevent women from feeling they belong (described as *ambient belonging*). Further, once such objects are removed or presented as more gender neutral, women's interest in environments socialized as typically masculine can be enhanced to a level more equal to that of their male peers. Thus, the practice of socializing underrepresented women into their graduate and professional fields becomes particularly important in academic departments, especially as it pertains to often overlooked social environment cues.

Although the present study offered support for the relevance for perceived congruity of women in their STEM environments, the study did not offer significant support that the relationship between role congruence and *persistence* was typically stronger for women. Yet, some of the results did suggest a unique circumstance as it related to career persistence. In the case of what appeared to be support for perceived incongruity influencing greater persistence, there may a particular phenomenon at work. Women in male-dominated spaces as mentioned, are often isolated and tend to lack social support, research also has suggested women often experience pressure to perform (Berdahl, 2007; Settles, 2004; Wyer et al, 2001). In addition, literature suggests the need to perform and in some cases *overperform* is an underlying dynamic related to coping in STEM environments (Morganson, Jones, & Major, 2010). That in some instances, the drastic *underrepresentation* of women, strengthens their desire to finish or complete their degree; and as a result they work harder towards it despite social isolation, and/or gender expectations. Ong et al. (2011) and Ong (2005) suggests this is even more the case, were women tend to push themselves to thrive in male-dominated STEM environments, when elements such as strong family and/or peer support are present. In this study, it seemed women tended to persist relatively equally with men despite perceiving less role congruence, and perhaps being all too familiar with male dominant culture, were yet committed to being resilient. Future research should continue to explore issues of over-performance and other questions pertaining to what causes women to thrive despite gendered barriers as it relates to congruent v. incongruent career paths, and the subsequent career choices of women, especially as it concerns STEM. Repetition can provide additional insight beyond that offered by this sample alone. Understanding the unique realities that exist for women on somewhat incongruent paths is integral to dealing with the persistent challenges of underrepresentation of women in STEM. In addition, understanding these realities which may or may not limit the career landscape for women can help to uncover appropriately targeted interventions.

Unlike role congruence, there were no *overall* significant differences between women and men on the variable identity compatibility, suggesting little to no differences between the perceived compatibility between their self and their major for women and men. The lack of results could be related to the sample in this study, as a greater portion of the sample was represented in the biological sciences, which are known for typically being more representative of women, while a smaller portion of the sample was represented by majors such as computer science or statistics (which tend to be less representative of women). It could be that identity compatibility was less of an issue, because most of the women were not in academic environments in which they identified as token or one of few (Kanter, 1977). Results also indicated fewer women identified as a token. Further, analyses of mean differences within disciplines suggested women in biological sciences in particular did demonstrate significantly higher identity compatibility compared to men, suggesting issues such as tokenism or being able to identify with one's discipline was somewhat less of a challenge in an environment were women are more represented. On the other hand, women identified as mathematics/statistics majors demonstrated significantly lower identity compatibility than their male peers. In the case of mathematics and statistics, though results did not significantly indicate women in this discipline viewed themselves as anymore of a token, it could be that unique differences as it related to the *environment* of mathematics & statistics in which gender is *performed* or *undone* (Frome et al, 2005; Powell et al., 2009) creates less perceived identity compatibility for women. Further, implications of *professional socialization* into the mathematics fields, compared to the biological sciences, could suggest an environment which still tends to encourage practices that inevitably maintain gendered barriers such as *social distancing* and *isolation* for women. Additionally, exploratory investigation suggested this may differ for individuals who identify as a racial minority and thus occupy a somewhat unique status within their discipline. For example, women of color who demonstrated somewhat lesser compatibility potentially experience different challenges to their identity including the way in which they are socialized into certain environments versus others. Thus, building from the current study, future research should continue to explore the manner in which women are socialized as professional into their discipline of choice, while also paying close attention to identity status and relevant experience.

Identity compatibility, similar to role congruence, also significantly influenced career persistence. It would seem in these circumstances a variable such as identity compatibility showed to be equally important for both women and men, such that for an individual in STEM to certain degree, it is positive when one can self-identify with their major or discipline. Further it could be argued that having a healthy self-concept of one's self in their respective field of discipline is perhaps prudent to their success. This is similar to findings supported by Frome et al, (2006) which suggested that an overall positive attitude towards science-related subjects or a high self-concept of ability elicit greater intentions for women to choose a STEM-related major while in college as well as subsequently aspire to a career in STEM (Eccles & Blumenfeld, 1985; Eztkowitz et al., 2000). Eztkowitiz et al. (2000) suggests challenging practices that consciously or subconsciously prohibit the development of interests and confidence in younger women in science and science-related disciplines and should involve early interventions such as addressing student-teacher exchanges, providing necessary interventions in the classroom, and minimizing behaviors that reinforce the privilege men in STEM. Though results for identity compatibility and self-concept were only partially supported here, future research should continue to explore such topics, and their influences on the potential aspirations and academic intentions of women.

The Impact of Efficacy

The study also investigated the role of efficacy as potential mediator in the congruence & identity model. Results offered only marginal support for the role of efficacy as a partial mediator between the variables role congruence and identity compatibility and career persistence. Although, results did suggest women demonstrated significantly higher career efficacy than men, which was not entirely expected. It would appear that women in this study though higher in role congruence or perceived disparity in the roles of women and scientist, demonstrated greater efficacy than men. It could be that women in such environments feel the need develop a certain *healthy confidence* to perform and perform well. Berdahl (2007) suggests this sometimes happens when women find themselves in spaces typically occupied by men. As well it could be that for men, efficacy tends to be less of an issue or need to their career persistence in STEM. It could also be that women in STEM already represent typically more efficacious students versus those not enrolled in STEM disciplines, as culturally such endeavors are generally believed to be laborious or tenuous challenges/goals (Zimmerman, 2000). Further, model analyses did reveal the relationship between role congruence and career efficacy was particularly different between women or men, suggesting several dynamics at play such as those mentioned and potential others. Future research should continue to explore efficacy, including different measures of efficacy, especially those measures which may account for background in STEM and may offer deeper insight into these findings. Research should explore the role of efficacy as a potential *buffer* for women used to mitigate challenges and barriers akin to traditional STEM environments.

Influence of Climate Perceptions

Another factor explored was the impact of climate on career persistence. The role of climate was viewed as important to investigate, as higher education institutions hold a high stake in rectifying historical inequities for women. And although, most higher education institutions are newly committed to embracing fairness, diversity, and equitable treatment, still the status, retention and advancement of female faculty, especially in STEM remain disparaging. This is so despite national interest or newly-structured public agenda in areas of science, math, and engineering (Blickenstaff, 2005). It was expected climate perceptions significantly influenced career persistence, and the relationship between climate and persistence would be stronger for women, but this was only partially the case. Results demonstrated climate perceptions did significantly explain persistence, yet the relationship between climate perceptions and persistence was no stronger form women compared to men. In addition, it was expected that women would also demonstrate more negative perceptions of climate, yet climate perceptions overall appeared no different for women compared to men. This once again can potentially be explained by the nature of the sample. As mentioned, majority of women were represented in the biological sciences, and did not readily identify as tokens of one of a few. Thus, women demonstrated more similar perceptions of climate to that of men (and were no more negative in their view compared to men).

Yet despite a lack of significance when considering disciplines together, there was evidence to suggest such results did not speak for every department or climate. Women who identified as physics majors held significantly more negative perceptions of climate compared to their male peers, suggesting certain climates in STEM may present greater amounts of resistance towards women than others, or perhaps have not progressed as far as those climates such as the biological sciences. For instance as it relates to identity in particular, answering such questions as why women in some STEM climates demonstrate greater identity compatibility than women in others, provide some basis for continuing to conduct research that is discipline and/or climate focused. Thus findings, in this study emphasize the importance of continuing to explore climate as an informing factor to understand persistence in STEM.

Though not entirely supported by the results of this study, future studies should explore implications of *fit* on factors such as self-efficacy, engagement, and commitment for women in STEM. Though not as apparent in this study, there may be other environments and climates where *fitting in* as one who represents a *token* or occupies a *tokened* perspective becomes a conflicting challenge where in order to assimilate to dominate culture, one also reinforces rather than challenges the dominant or majority and often isolating perspective (Heilman, 2001; Kanter, 1977). As such is often the case in STEM disciplines.

In addition, research suggests women feel more invited into the STEM environment if they feel they not only belong, but that they also have a voice. Settles et al. (2007) demonstrated issues related to both *visibility* and *voice*, or perhaps the lack thereof are directly related to women's perceptions of their environments; where lower levels of job/career satisfaction were related to less perceptions of having a voice in traditionally male climates. Thus, women's presence and their voice effectually influence their perceptions of their workplace environments such that less favorable perceptions of gendered climates is directly related to overall satisfaction and future satisfaction of women (Settles, 2004). Ultimately, being visible speaks to the necessity of women's positive assertion of their identity within their typically male-defined STEM work environments. Exploring interpersonal cues such as *voice* and *visibility* as predictors of climate perceptions (chilly or hostile), and even psychosocial factors such as well-being were beyond the scope of this paper, but stands to be particularly critical for the advancement of women in STEM going forward. This may have very real implications for women who are also racial or ethnic minorities as issues of voice and/or visibility could be even more emphasized (Cortina, 2008; Berdahl, 2007). Thus future research should also explore the diversity within the experiences of women. Future studies should explore issues related to *politics* and *power* and ultimately *privilege* within various climates and as a part of student-teacher, peer-peer, supervisor-peer relationships which can potentially negatively influence motivation and confidence of women in STEM.

Limitations

Although the present study does offer some revealing insight, it does so with limitations. First, the sample itself may have been limited in *representativeness* as it was not a probability sample, and possibly contributed to the lack of findings or frequent results which only approached levels of statistical significance. It was believed that gathering data from several departments/climates (via snowball method) would produce more informing results. However, it could be those who choice to respond and then to re-distribute survey do not represent the sentiments of women in general and may hold beliefs that are perhaps ‘atypical.’ In addition, it could be phenomenon was missed in some departments vs. others by not focusing in on a particular department of study (i.e. computers science/engineering or statistics) and allowed for the unique characteristics or challenges in respective departments to be unintentionally overlooked. It could be that climates and phenomenon are uniquely specific to certain majors and/or major departments, thus survey material, or items, or measures which were poignant or relevant for some participants are less so for others. This could explain differences obtained in a climate such as biological science versus mathematics/statistics, suggesting focusing in on a particular department might have been more informative. Further, posing questions to participants who would otherwise in any other setting not relate to, could have been problematic or made participants uncomfortable or resistant to pass survey along. Such as potentially demonstrated in the willingness of participants to provide information regarding their demographics (e.g. Major, Race). This may represent an opportunity of resistance where there exists a comparatively lack of appreciation for reporting demographic information in STEM discipline research specifically. Thus, identifying this type of information poses some risk(s) (e.g. identity, stigma, etc.) for individuals. Understanding on a one-to-one personal basis about the specifics of climate (i.e diversity assessment), and or particular communications and/or climate challenges may have proved helpful. This information could have perhaps been achieved in focus groups or pilot study.

Second, this information from potential focus groups or pilot study would have been useful for constructing the survey, and choosing measures. Some research suggests in order to develop a more accurate depiction of STEM environments, it is important to recognize and describe issues *from* STEM perspective (Bybee, 2010) which is perhaps different from other social research. This requires using keywords, semiotics descriptions, explanations which consider this perspective and/or terminology of social events centering the STEM perspective as the critical lens. Thus, language, items, and scales used would then be particularly relevant. Doing such a task may also have garnered more support from participants, producing a greater sample in the respective areas of interest (as a greater sample may have been needed to achieve expected results).

Third, without such consideration, it could be that survey lacked some *salience* for current STEM majors. Without the use of more targeted items (those centered in STEM perspective), individuals might have found the items irrelevant or inapplicable, hard to understand within the confines of STEM context, or even uncomfortable given at times resistant climates. This may have implications for the variable role congruence and why in particular fewer participants responded to this measure, especially women.

Finally, it could be the model was limited in its inclusion and exclusion of certain variables. For instance this study only focused on role congruence and identity compatibility, yet other variables such as commitment or engagement, gender centrality may account for additional responses not achieved by the current model. Future studies should also explore other variables as potential correlates and antecedents (e.g. personality, goal orientation, motivation, culture, etc.).

Theory Development & Practical Implications

Previous research suggests role congruity theory and the social consensus in understanding of gender roles establishes positions and certain areas of industry that are perceived as less gender appropriate for women (Eagly & Karau, 2002). Findings from the current study suggest gender congruity and gender ideology are apparent in the STEM industry as well, where the male-normed culture of science is a reality. This study also built upon former research to explore identity compatibility in STEM (Rosenthal et al, 2011) which presented interesting findings where factors such as discipline, become particularly important. This suggests identity compatibility is a dynamic factor for women in STEM and to a certain extent depends on the specific STEM environment in which they find themselves. Further, issues of identity (and congruence) or other *socializing* phenomenon, if discipline-specific, also potentially produce uniquely-related realties for women, given the culture within particular STEM environments. Thus, modifying compatibility theory as well as role congruity theory to account for discipline-based challenges and barriers would seem vital for future research.

Therefore, and despite given limitations, the study does support the development of career theories which are specifically STEM relevant and/or STEM focused. Further, the findings of this study suggests the development of new theory pertaining to STEM environments in particular, which take into account identity issues such as compatibility and gender role congruence. For example, research should explore identity and role congruity as it relates to psychological and social well-being as well as overall STEM career satisfaction. Or for example, explore whether the extent or magnitude of identity issues are related to the degree to which the industry of choice makes an effort to socialize women as science professionals.

STEM career theory should explore differences in leadership strategies or strategies for advancement which are unique to women in the STEM professions. What are the goals for these women? What types of choices and/or sacrifices have to be made? Is this different across respective STEM majors/disciplines? How can their strategies for advancement be built upon to uncover a leadership model that propels the advancement of other women in science? Thus, STEM career theory should address issues of socialization, and the necessity of professional socialization which is not bound by 'male-normed' understandings of *scientists* or *science culture*. Exploring such topics both quantitatively and qualitatively is vital for elaborative understanding.

In addition, theory should continue to fervently explore and address the *construction* of gender within the confines of industry. Investigating circumstances that are similar across industries as well as those that may be idiosyncratic is critical to advancing what is understood as well as required of women professionals to thrive in STEM careers. Conducting research that reconciles *gendered ideology* with the desires of women in STEM is imperative to strengthening women's representation across STEM industries and disciplines.

The implications of this type of research are far-reaching. Organizations and institutions have long desired to understand what continues to ail the STEM career pipeline, given many of them have invested much time, money, and effort to in some respects get ahead of the trends toward underrepresentation and inequity. Tapping into STEM career theory particularly, could prove a better, more inclusive and informative means to target women, their professional and personal needs, and their interests. As a guide, such theories can potentially produce more *strategic* interventions which can appropriately tackle lingering challenges of inequity in STEM. As a goal, this line of theory development further enhances our understanding of the realities of women in the STEM professions. Finally, development of STEM-centered career theory as well as discipline-based research stands to benefit women themselves, those who desire to persist in what could oft be described as *incongruent* career paths.

Conclusion

In short, bringing women into science continues to require culturally validating and affirming their *role* in STEM as just as socially appropriate and socially congruent as men's (Gherardi, 2004). Further, establishing climates and cultures that are actively aware of the challenges women face is critically important to keeping women in the pipeline. Lastly, both individual and institutional support systems can help to better serve women's progression in these environments. Thus, research and institutions should continue to outline unique factors that exist for women in STEM careers.

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APPENDIX

Role Congruence

Women as *Research Scientists* (modified WARS)

Instructions: The statements cover many different and opposing points of view; you may find yourself agreeing strongly with some of the statement, disagreeing just as strongly with other, and perhaps uncertain about others. Whether you agree or disagree with any statement, you can be sure that many people feel the same way you do.

Rating Scale:

1 - Strongly Disagree
2 - Disagree
3 - Slightly Disagree
4 - Neither Disagree or Agree
5 - Slightly Agree
6 - Agree
7 - Strongly Agree

Using the number from 1 to 7 on the rating scale, indicate your personal opinion about each statement by circling the appropriate number from the scale given in the column that immediately succeeds it. Remember, give your personal opinion according to how much you agree or disagree with each item. Please respond to all items.

1. It is less desirable for women than for men to have a job that requires responsibility. (R)
2. Women have the objectivity required to evaluate **(work)** situations properly.
3. Challenging work is more important to men than it is to women. (R)
4. Men and Women should be given equal opportunity for participation in **(science leadership)** training programs.
5. Women have the capability to acquire the necessary skills to be successful **research scientists**.
6. On the average, women are less capable of contributing to an institution's overall goals than are men. (R)
7. It is not acceptable for women to assume **leadership roles in science** as often as men. (R)
8. The development community should some day accept women in key **leadership roles in science**.
9. Society should regard work by female **(scientists)** as valuable as work by male **(scientists)**.
10. It is acceptable for women to compete with men for **leadership roles in science**.
11. The possibility of pregnancy does not make women less desirable employees than men.
12. Women would no more allow their emotions to influence their behavior than would men.
13. Problems associated with menstruation should not make women less desirable than men as employees.
14. To be a successful **research scientist**, a women does not have to sacrifice some of her femininity.
15. On the average, a women who stays at home all the time with her children is a better mother than a woman who works outside the home at least half time. (R)
16. Women are less capable of learning mathematical and mechanical skills than are men. (R)
17. Women are not ambitious enough to be successful in the working world. (R)
18. Women cannot be assertive in **science work environments** that demand it.(R)
19. Women possess self-confidence required of a good researcher.
20. Women are not competitive enough to be successful in the working world. (R)
21. Women cannot be aggressive in **science work environments** that demand it.(R)