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DOES MENTORING BUFFER WOMEN IN SCIENCE FROM THE EFFECTS

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ABSTRACT

Campbell, Emily. M.S., Purdue University, May 2016. Does Mentoring Buffer Women in Science from the Effects of Perceived Discrimination on Career Outcomes? Major Professor: Leslie Ashburn-Nardo.

The number of women working in STEM areas of academia declines as rank progresses—a phenomenon termed the "leaky pipeline" (Burke, 2007). The leaky pipeline is due in part to discrimination. Women in STEM report high perceived discrimination, which is associated with negative career outcomes (Settles, Cortina, Stewart, & Malley, 2007; Pascoe & Richman, 2009). No research to date has examined whether mentoring might buffer the negative effects of perceived discrimination for female professors working in STEM areas of academia. This study examines whether mentoring relationships moderate the relationships between perceived discrimination and career outcomes including job satisfaction and work engagement for women in STEM. 118 women faculty in STEM completed an online survey of perceived discrimination, job satisfaction, and engagement. Although results revealed main effects of perceived discrimination and mentoring, mentoring did not moderate the relationship between perceived discrimination and outcomes. Exploratory analyses provide future research directions to understand the leaky pipeline.

CHAPTER 1 INTRODUCTION

1.1 The Leaky Pipeline

Fewer women are found in faculty positions in the areas of Science, Technology, Engineering, and Math (collectively termed STEM) than in any other area of academia (Dean & Fleckenstein, 2007). This gender gap in STEM begins after a Bachelor's Degree is earned and becomes progressively worse when examining higher degrees and tenure-track faculty positions. In other words, women in STEM faculty positions are underrepresented compared to the proportion earning degrees (Dean & Fleckenstein, 2007). More specifically, women earn 51% of science and engineering bachelor's degrees, while comprising 46% of master's degrees and 41% of doctorates in those same areas (NSF, 2015).

This underrepresentation is even more pronounced when examining career choices and specifically higher level faculty positions in STEM. Although women comprise half of the bachelor degrees in STEM areas and make up 40% of doctorate degrees, they fill only a quarter of the total STEM workforce (American Community Survey Reports, 2013). Specifically within the sciences in academia, according to 2013 NSF statistics, women occupy 43% of assistant professor positions, 34% of associate professor positions, and 21% of full professor positions (NSF, 2015).

A similar pattern has been found at IUPUI. Women comprise 23% of faculty positions in STEM areas at IUPUI (IMIR, 2014). More specifically, women comprise 30% of assistant professors, 30% of associate professors, and 11% of full professors (IMIR, 2014). These statistics show that currently few women hold leadership positions at IUPUI in STEM areas. Dankoski (2010) obtained similar findings for women in the Indiana University School of Medicine (IUSM) in saying that the majority of women faculty are on non-tenure tracks, and remain at the assistant professor rank (Dankoski, 2010).

The phenomenon in which numbers of women decline as rank progresses has been termed the "leaky pipeline" (Burke, 2007). The progression of women earning a degree in STEM and advancing toward a full professor position in their field is comparable to a pipeline. At each stage of advancement, fewer women succeed to the next position – analogous to the "leaks" in the pipeline.

1.2 The Role of Gender Biases

Various theories have attempted to explain why few female faculty in STEM are present in higher ranks. Some theories suggest that there are small numbers of women in STEM fields initially; that work-family conflict may present a greater challenge for women than for men; that there may be actual gender differences in leadership ability, with men having an advantage over women; and that differences in women's preferences of work styles and goals lead them to select out of STEM (Eagly & Carli, 2007; Greenhaus & Beutell, 1985; Sonnert & Holton, 1995; Wright, Schwindt, Bassford, Reyna, Shisslak, & Germain, 2003). However, the explanation that has garnered the most recent attention is that of gender bias. The present paper will therefore focus on gender

bias as a factor that may undermine women's success in STEM. Despite no evidence of being less capable than men in STEM fields, women are still stereotyped as less capable than men in both STEM fields and in leadership roles (Hyde, 2007; Moss-Racusin, Dovidio, Brescoll, Graham and Handelsman, 2012).

These messages are conveyed in many ways and are often more subtle than one might expect when one imagines gender-based discrimination. Examples of such subtle behaviors are shared jokes that portray women in a negative light or assigning women to easier tasks that do not aid in career-advancement (Dean & Fleckenstein, 2007). Women faculty in the sciences are often seen as "girls" and are viewed as playing around – not doing real research (Kantola, 2008). Another example of a subtle discriminatory behavior would be assigning women vague goals. Among interviews with faculty in the sciences, more than three times as many women than men reported vague or unclear aspirations when they started (15.9% women versus 4.4% men) (Sonnert & Holton, 1995). These behaviors have been described in the literature in various ways: *micro-aggressions*, *subtle forms of discrimination*, *everyday sexism*, *everyday prejudice*, and *interpersonal discrimination* (Dean & Fleckenstein, 2007; Solorzan, Ceja, & Yosso, 2001; Stangor, Swim, Van Allen, & Sechrist, 2002; Swim, Hyers, Cohen, & Ferguson, 2001).

Regardless of what those biases are termed, they occur with great frequency. Women in college report experiencing "everyday sexism" at least one to two times a week and some even daily (Swim et al., 2001). In a faculty survey given at IUPUI, 25% of women in Engineering and Technology reported receiving negative or disparaging comments due to their gender, 20% reported experiencing offensive language or humor

due to their gender, and 15% reported harassment and discrimination due to their gender (IMIR, 2009).

Not only do women in STEM perceive discriminatory comments often, but they are also provided fewer opportunities and more obstacles to their success (Sonnert & Holton, 1995). Specifically to faculty in academia, more women than men in the School of Science report the following due to their gender: feeling isolated or unwelcome (20.0% women versus 6.3% men); not being taken seriously (35.0% women versus 0% men); and discouragement in pursing academic goals (10.0% women versus 0% men) (IMIR, 2009). Similar results were found when examining women in engineering and technology disciplines (IMIR, 2009).

Women feel especially discriminated against when trying to go into male-dominated areas of work (Dean & Fleckenstein, 2007; Mansfield, Koch, Henderson, Vicary, Cohn, & Young, 1991; Margolis & Fisher, 2002; Settles, Cortina, Malley & Stewart, 2006). Settles, Cortina, Stewart, and Malley (2007) found that female faculty in the natural sciences (i.e., STEM areas) perceived significantly higher instances of sexual harassment, gender discrimination and a sexist climate than female faculty in the social sciences. Niemann and Dovidio (1998) provide a possible explanation for why this occurs; women who are the only females in their department perceive they are the *token woman*. When women feel that there are no other people in their department like them, they tend to be more sensitive to acts of discrimination (Niemann & Dovidio, 1998). More specifically, Niemann & Dovidio (1998) found that individuals who were "solo" in their department (i.e., the only one of their race/ethnicity) reported higher levels of racial

distinctiveness (including unequal treatment) than those minorities who had other people like them in their department.

Furthermore, due to the pervasive stereotypes regarding their ability in science and math and the fact that gender is more salient for women in male-dominated areas, women in STEM are at greater risk of experiencing *stereotype threat.* Roberson and Kulik (2007) define stereotype threat as a "psychological experience of a person who, while engaged in a task, is aware of a stereotype about his/her identity group suggesting that he/she will not perform well on that task," (p. 26). This internal process leads those who experience stereotype threat to perform poorly. Logel, Walton, Spencer, Iserman, von Hippel, and Bell (2009) found that women undergraduate students in math, science and engineering exposed to sexist cues performed significantly lower on a math test than women who were not exposed to sexist cues. Sexist cues did not affect women who took English tests (Logel et al., 2009). This finding exemplifies stereotype threat because the confederates make gender salient in the participants' minds right before taking a test, which triggers the stereotype about their identity – not being good at math. Ironically, people who care about their work and really want to do well are the most likely to be affected by stereotype threat (Roberson & Kulik, 2007). The most talented and engaged women are the most likely to experience stereotype threat because they are the ones most concerned with achieving high performance levels within the domain and find it self-relevant (Steele, Reisz, Williams, & Kawakami, 2007).

Not only do women experience discrimination and stereotype threat personally, but they may also witness discrimination directed at other women or observe artifacts within the organization that portray a prejudiced attitude. These indirect incidents can be

referred to as *ambient discrimination*. For instance, a female faculty member in a Science department may only see pictures of male scientists posted along the hallway or hear her male colleagues talk down to another woman in the department. Research has found that workers' experiences with bystander harassment have incremental, negative consequences on the job and coworker satisfaction even after their personal experiences with discrimination, their affective disposition, and their ethnicity were taken into account (Glomb, Richman, Hulin, Drasgow, & Schneider, 1997; Low, Rhadhakrishnan, Schneider, and Rounds, 2007).

Collectively, experiences with and perceptions of discrimination, stereotype threat, ambient discrimination, etc. create a *chilly climate* for women in STEM and other male-dominated environments (Dean & Fleckenstein, 2007; Settles et al., 2007). These negative experiences that women report (such as discrimination and bias) add up to hinder them from excelling in these areas (Sonnert & Holton, 1995).

<p style="text-align:center">1.3 Consequences of Perceived Discrimination</p>

Women who experience discrimination and prejudice tend to report psychological distress including, "role conflict, devaluation, low self-esteem, lack of confidence, depression, discouraged achievement, victimization, dependency, and feelings of helplessness" (p. 125, Nutt, 1999). Also, feelings of distress, lower comfort levels, high anxiety, and anger occur in women who experience a chilly climate (Swim et al., 2001). A meta-analytic study by Pascoe and Richman (2009) showed that the more women perceive discrimination the more they tend to experience mental health problems, physical health problems, and stress issues, and the more they tend to have poor health behaviors (e.g., lack of sleep and exercise).

Ultimately, these negative feelings and health issues associated with a chilly climate lead to poorer job outcomes and physical withdrawal (Volpone & Avery, 2013). These job-related consequences for women who perceive discrimination in STEM are of focus to the current study. Powell, Bagihole, and Dainty (2007) mention that women may be driven away by negative and harsh climates that create a dominant and masculine atmosphere. Aspects of a chilly climate (i.e., attitudes portraying bias, sexism, etc.) leave women feeling less satisfied and unable to achieve their full potential, affect promotions and often result in an exit from the field (Eagly, 2007; Powell, Bagilhole, & Dainty, 2007; Roberson & Kulik, 2007; Settles et al., 2007). Concerns about confirming a negative stereotype may distract women from optimal performance, causing them to disengage, and potentially disidentify with the area of interest (Dean & Fleckenstein, 2007; Steele, 1997; Steele, James, & Barnett, 2002).

1.4 Job Satisfaction

One particular negative job outcome related to perceptions of discrimination is job satisfaction (Settles et al., 2006; Settles et al., 2007). A variety of factors have been found to be predictive of job satisfaction, several of which are similar to the experiences of women in STEM. People who do not enjoy working with their coworkers and supervisors have been found to be less satisfied with their job (Mossholder, Settoon, & Henagan, 2005). Additionally, the extent to which an employee perceives they are being treated fairly predicts job satisfaction (this judgment of equity is based on perceptions of the employee) (Aamodt, 2007). Finally, a lack of opportunity for growth and advancement has been shown to decrease satisfaction (Aamodt, 2007). Given that research has revealed similar phenomena among women in STEM, it seems reasonable to

conclude that women in STEM who are high in perceived discrimination may experience decreased job satisfaction.

Indeed, research supports that women who experience a chilly climate at work report lower job satisfaction (Low et al., 2007; Niemann & Dovidio, 1998; Settles et al., 2006; Settles et al., 2007). This is of major concern because as mentioned previously job satisfaction tends to predict retention (Glomb et al., 1997; Higgins & Thomas, 1991; Sourdif, 2004). If women have low job satisfaction, they are less likely to remain in STEM fields. Thus, job satisfaction is a key outcome variable that will be measured in this study.

In order to focus job satisfaction towards specific facets that can be used to assess satisfaction for women in STEM, Settles et al. (2007) and Settles et al. (2006) conceptualized a narrower definition of job satisfaction that includes dimensions of professional development including satisfaction with faculty interaction, resources and salary, being valued for scholarship and instruction, work–life balance, level of intellectual stimulation, and overall satisfaction with the current position at the university. This particular conceptualization will also be used in this study to estimate job satisfaction for women in STEM.

<div align="center">1.5 Engagement</div>

A lesser studied job-related outcome of perceived discrimination, but one of interest in this study is *engagement*. Engagement can be defined as "a positive, fulfilling, affective-motivational state of work-related well-being" (Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002). Employees who are engaged tend to be enthusiastic about coming to work and identify strongly with their work. It is important to investigate

engagement because it predicts job performance, which has obvious consequences for the success of women in STEM (Bakker, Schaufeli, Leiter & Taris, 2008).

Engagement has been found to arise from aspects of one's job, aspects of the organization, and aspects of the individual (Bakker, Schaufeli, Leiter, & Taris, 2008; Saks, 2006). Saks (2006) found that certain characteristics of the job (i.e., skill variety, task identity, task significance, autonomy, and feedback from Hackman and Oldham's (1980) job characteristics model) predicted only work/job engagement; procedural justice predicted only organizational engagement; and perceived organizational support predicted both work/job engagement and organizational engagement. Additionally, job engagement and organizational engagement mediated the relationship between the antecedents just mentioned and job satisfaction, organizational commitment, intentions to quit and organizational citizenship behavior (Saks, 2006). Similarly, Schaufeli and Bakker (2004) found that available job resources predict work engagement, and that work engagement is related to turnover intentions; thus supporting work engagement's mediation between job resources and turnover intentions. Most relevant for the present research, climate has been found to be predictive of work engagement in a study by Hakanen, Bakker, and Schaufeli (2006), such that the more negative the climate, the less engaged are the employees.

Schaufeli et al. (2002) broke work engagement into three facets: vigor, dedication, and absorption. Vigor was defined as, "high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties," (Schaufeli et al. 2002, p.74). Schaufeli et al. (2002) described dedication as, "a sense of significance, enthusiasm, inspiration, pride and challenge," (p. 74). The

last component of engagement is absorption, characterized by "being fully concentrated and deeply engrossed in one's work, whereby time passes quickly and one has difficulties with detaching oneself from work." (Schaufeli et al., 2002, p.75).

There has not been consistency in the literature as to whether to examine the three components of work engagement and their relationships towards other variables separately, or together as one factor of engagement. A number of studies have found the components to be highly correlated with one another (Schaufeli, et al. 2002; Bakker et al., 2008). However, other studies have found the three-factor model to fit significantly better than the one-factor model (Schaufeli, Bakker, & Salanova, 2006). Some have argued that the overall score for work engagement may be more useful in empirical research than the separate scores on the three dimensions (Schaufeli & Bakker, 2010). For the purposes of this study, hypotheses will be made at the overall construct level; however, should factor analysis reveal a more complex structure of engagement, each sub-factor will be examined individually.

1.6 Mentoring Relationships as a Buffer from Perceived Discrimination in STEM

Several programs have been founded to look further into gender gaps in STEM, verifying that the leaky pipeline is a nationally recognized problem. For example, a commission was developed by the National Institute of Health (NIH) to examine best practices for sustaining women in biomedical careers ("Women in Biomedical Careers", 2010). Similarly, the National Science Foundation (NSF) funds many research projects on this subject area to learn more about how to retain women in STEM areas.

Many researchers have suggested using mentoring as a means of supporting and encouraging female faculty in STEM areas (Eagly & Carli, 2007; Mendoza-Denton,

Downey, Purdie, Davis & Pietrzak, 2002; Ragins, Townsend & Mattis, 1998; Roberson & Kulik, 2007; Settles et al., 2007). Theoretically, mentoring has generally been a "good" intervention for employees. That is, it has been found to enhance employees' success in organizations. Eagly and Carli (2007) state "women gain from strong and supportive mentoring relationships and connections with powerful networks" (p. 70). O'Brien and Biga (2008) explain that "although differential access to mentoring may not be a cause of the glass ceiling, in some instances, mentoring may help overcome these barriers." (p. 549). This study will see if mentoring experiences provide a buffer from perceived discrimination for women in STEM areas.

Traditionally, mentoring has been conceptualized as dyadic (i.e., provided by one individual to one individual), but today people may have a constellation of mentors made up by their peers and supervisors (Higgins & Kram, 2001; Higgins & Thomas, 2001; Janasz &Sullivan, 2004). Constellations of mentors have been referred to as *developmental networks* (Higgins & Kram, 2001; Higgins & Thomas, 2001; Janasz &Sullivan, 2004). Rather than having one mentor, individuals tend to have multiple mentors for developmental support. Not only is this occurring more often in the workplace today, but it is more beneficial for the protégé (Janasz & Sullivan, 2004). For example protégés profit more from a variety of different mentors who each offer unique knowledge that will aid in their development as opposed to only one mentor offering advice (Janasz & Sullivan, 2004).

Whether dyadic or as a constellation, there are two general purposes of mentoring. Individuals may utilize mentoring to accomplish work-related tasks and goals, *career-oriented mentoring*, and/or they may develop relationships that provide emotional

support, *psychosocial mentoring* (Allen & Eby, 2004; Allen, Eby, Poteet, & Lentz, 2004; Kammeyer-Mueller & Judge, 2008; Ragins & Cotton, 1999; Williams-Nickelson, 2009). Career functions serve to develop the protégé professionally and psychosocial functions provide emotional stability and social support to cope with challenges on the job.

The developmental network of employees that provide both career and psychosocial support to a protégé has been found to have positive outcomes similar to those found in traditional mentoring relationships (Belenky, 1986; Gilligan, 1982; Higgins & Thomas, 2001; Singh, Ragins, and Tharenou, 2009; Van Emmerick, 2004). In fact, others would argue that developmental relationships may provide even more of these functions (Janasz & Sullivan, 2004). To expand, although both career and psychosocial functions can be met by one mentor in a dyadic relationship, it is difficult to provide each function to the protégé adequately. Instead, developmental network relationships allow the protégé to be provided with a wide array of these two functions from a variety of mentors (Janasz & Sullivan, 2004).

Mentoring relationships can be organized and set up, *formally*, or can occur naturally, *informally* (Allen & Eby, 2004; Chao, Walz, & Gardner, 1992; Ragins & Cotton, 1999; Ragins, Cotton, & Miller, 2000; Wasburn, 2007). The literature appears to be mixed as to which type is more effective; it may depend on the environment the mentoring relationship occurs. Generally few academic organizations have a formal mentoring process and more often informal relationships arise spontaneously (Janasz & Sullivan, 2001). This may be why many studies favor informal mentoring (Ragins & Cotton, 1999; Scandura & Williams, 2001; Williams-Nickelson, 2009), but some

acknowledge that it may not be easy for women in STEM to develop those informal relationships because of the chilly climate (Settles et al., 2006).

Mentored individuals can experience a variety of positive effects. Mentoring outcomes can be divided into objective and subjective domains. Mentoring has been found to lead to the objective outcomes of promotion and increased income (Allen et al., 2004; Dreher & Ash, 1990; Kammeyer-Mueller & Judge, 2008; Koberg, Boss, & Goodman, 1998; Underhill, 2006). More subjective outcomes that have been found to be related to mentoring are situational satisfaction and attachment, interpersonal relations, motivation and involvement, decrease of psychological stress and strain, and reduced withdrawal behaviors, job satisfaction, and commitment (Allen et al., 2004; Dreher & Ash, 1990; Eby et al., 2007; Kammeyer-Mueller & Judge, 2008; Koberg, Boss, & Goodman, 1998; Underhill, 2006). Studies have found that social support from colleagues, supervisors and the organization that can be gained from mentoring relationships predicts work engagement, another subjective outcome (Bakker & Demerouti, 2008; Bakker et al., 2008; Giblin & Lakey, 2010; Saks, 2006). Specifically, among the significant correlations Allen et al. (2004) found in their meta-analysis, the strongest were between mentoring and job satisfaction, expectations for advancement, career satisfaction, and promotions. Although subjective outcomes are more attitudinal they can be just as important because they tend to lead to objective outcomes (Allen et al., 2004). Further, although objective outcomes may seem more concrete, they are often contaminated with other factors such as the status of the company, economy, etc. (Allen et al., 2004). For these reasons, the current study will examine two subjective outcomes (i.e., job satisfaction and engagement) in relation to mentoring.

While the aforementioned studies show a direct relationship between mentoring and subjective career outcomes like job satisfaction and engagement, to date, the only study to examine the buffering effects of mentoring is Settles et al. (2007). Settles et al. (2007) proposed leadership and mentoring from females as means for women to achieve voice in the workplace. In addition, Settles et al. (2007) proposed voice to buffer the relationship between a chilly climate and job satisfaction such that the more voice women have from mentoring and leadership experiences, the less a chilly climate will affect their job satisfaction (see Figure 1). In fact, a significant interaction was found between voice and negative workplace climate in predicting satisfaction for women in nontraditional areas of academia (Settles et al., 2007).

<p style="text-align:center">1.7 Hypotheses</p>

Similar to Settles et al. (2007), the current study examined the effects of perceived discrimination on job satisfaction, but added an additional outcome variable of engagement. Additionally, rather than examining mentoring from females as a means to achieve voice, the quality of mentoring relationships that involve both males and females were examined as a direct buffer between perceived discrimination and the outcomes of job satisfaction and engagement (see Figure 2).

Hypothesis 1: There will be an interaction between perceived discrimination and mentoring predicting job satisfaction (see Figure 3) such that:

Hypothesis 1a: For women who report having relatively low quality mentoring relationships, the higher they are in perceived discrimination the lower their reported job satisfaction.

Hypothesis 1b: For women who report having relatively high quality mentoring

relationships, perceived discrimination will not be predictive of job satisfaction.

Hypothesis 2: There will be an interaction between perceived discrimination and

mentoring predicting engagement (see Figure 4) such that:

Hypothesis 2a: For women who report having relatively low quality mentoring

relationships, the higher they are in perceived discrimination the lower their

reported engagement.

Hypothesis 2b: For women who report having relatively high quality mentoring

relationships, perceived discrimination will not be predictive of engagement.

CHAPTER 2 METHOD

2.1 Participants

Two strategies were used to recruit participants for this study; the first being through listservs. Two listservs were utilized to request participation from female tenure-track faculty. These listservs advertised the survey to approximately 810 individuals. As a secondary strategy, 26 Deans of STEM areas within several Midwestern universities were contacted for their support in recruiting participants for this study. Upon agreement, 8 Deans sent out an email to female faculty in their respective departments soliciting participation in the survey.

Responses were collected from 218 individuals, but after filtering out non-relevant cases (e.g., males, non-tenure track faculty), the sample totaled 118 female faculty at several large Midwestern universities in the schools of Science, Technology, Engineering, and Math. All held doctoral degrees in their particular discipline. The mean age of participants was 43 years old, and each respondent on average had been in their current rank for 4.5 years. Participants were predominantly White (90%). Participants varied in terms of their rank – 31% Assistant Professor, 40% Associate Professor, 28% Full Professor.

<div align="center">2.2 Procedure</div>

This study utilized a correlational, cross-sectional design. A fixed random order of questionnaires was used in which items were randomized within their construct and then fixed for every survey. Participants received an email requesting participation in a study about attitudes and perceptions at work, and a link to take the survey was included. To incentivize participation, a lottery procedure granted $25 Amazon gift cards to 4 randomly selected participants. A reminder was sent to all non-respondents one week after the initial email. All survey responses were voluntary and anonymous.

<div align="center">2.3 Measures</div>

Perceived Discrimination. Thirty items that were piloted by Williams and Ashburn-Nardo (2010) were used to measure everyday prejudice. Example items of perceived discrimination include, "Women in my department have been left out of activities because they center around stereotypically male interests", "Female faculty tend to have less influence within the department, regardless of their seniority or expertise," and "In my department, I have overheard sexualized comments about women." Responses ranged from 1 (*strongly disagree*) to 7 (*strongly agree*).

Mentoring. Participants were asked to "Consider one or more individuals who have advanced experience and knowledge in your field (but need not be of higher status than you) who give you support, guidance, and advice for your career plans and interpersonal development. These can be individuals inside and/or outside your department. To what extent do these individual(s)… (e.g., …offer assistance with publications and creative activity; …protect you from individuals who attempt to damage your progress towards tenure and promotion.; …explain (i.e., helps you learn about) the

political realities of working at a college/university). This measure was adapted from Schrodt, Cawyer and Sanders (2003). Responses were collected on a five-point scale from 1 (*not at all*) to 5 (*to a great extent*).

To gauge developmental network relationships (as fulfilled by gender), participants were asked, "How many women provide you with the mentoring functions listed above?" and, "How many men provide with the mentoring functions listed above?" To gauge the amount of formal and informal mentoring relationships that existed, participants were asked, "To what extent is support you receive from informal relationships?" and, "To what extent is support you receive from formal relationships?" To gauge the extent of career-related and psychosocial support (as fulfilled by gender), participants were asked, "To what extent do you receive career-related support from women?," "To what extent do you receive career-related support from men?," "To what extent do you receive personal and emotional support from women?," "To what extent do you receive personal and emotional support from men?" Lastly in regards to mentoring, participants were asked, "To what extent is the support that you receive inside your own academic department?" Responses to these items were collected on a five-point scale from 1 (*not at all*) to 5 (*to a great extent*).

Job satisfaction. Participants' satisfaction with their jobs was adapted from Settles' et al. (2007) 13-item measure which was partially adapted from the University of Michigan Faculty Work-Life Study (CSHPE & CEW, 1999). Participants were asked about their overall satisfaction with faculty interaction, resources and salary, being valued for scholarship and instruction, work-life balance, level of intellectual stimulation and overall satisfaction with the current position at the university. Sample items include,

"opportunity to collaborate with other faculty," "level of intellectual stimulation in my day-to-day contacts with faculty colleagues," "level of funding for my research or creative efforts," "ability to attract students to work with me," and "sense of being valued for my teaching by members of my department." All items are included in Appendix C. Response scales ranged from 1 (*very dissatisfied*) to 5 (*very satisfied*).

Engagement. Employee engagement was measured using an adapted 17-item measure developed by Schaufeli et al. (2002). Schaufeli et al. (2002) broke engagement down into three facets (i.e., vigor, dedication, and absorption). Sample items from each of the facets include, "When I get up in the morning, I feel like going to work," (vigor) "I am proud of the work I do," (dedication) and "When I am working, I forget everyone else around me," (absorption). Responses ranged from 0 (*never*) *to* 6 (*always*).

In addition, departmental engagement was measured using an adapted version of Saks (2006) 6-item measure. Saks (2006) measured organizational engagement with the 6-item measure and rather than measuring organizational engagement, this study sought to measure departmental engagement. Therefore, the word *organizational* was replaced with departmental in each of the items. Sample items include, "Being a member of this department is very captivating," "One of the most exciting things for me is getting involved with things happening in this department," and "I am highly engaged in this department." Responses ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

Demographic variables. Race/ethnicity, age, and organizational rank were measured for descriptive purposes.

A list of all items from each measure is included in Appendix A-E.

CHAPTER 3 RESULTS

3.1 Preliminary Analyses

One item within departmental engagement was reverse-scored in preparation for exploratory factor analyses and further hypthesis testing. In order to ensure the measures used in the current study have sound content validity with an academic sample, a principal components factor analysis using varimax rotation (examining Eigenvalues greater than 1 and via a scree plot analysis) was applied to items theoretically comprising each of the following constructs: perceived discrimination, mentoring, job satisfaction, employee engagement, and departmental engagement.

Perceived Discrimination

Consistent with a pilot study by Williams and Ashburn-Nardo (2010), analyses and scree plot suggested a one-factor solution for perceived discrimination, which accounted for 59.1% of the variance. The items that loaded on the first factor were consistent with what the construct was originally intended to measure – perceptions of being perceived as inferior and/or discriminated against on the basis of gender (e.g., Female faculty are often interrupted in meetings; Women in my department often feel their voice/opinion is not heard; Female faculty tend to have less influence within their department, regardless of their seniority or expertise.) Items that did not load onto the first factor seemed to measure other constructs (e.g., others' discomfort with females

displaying agentic behaviors), and therefore were dropped from further analyses. The items that were dropped are listed here: Tasks involving party planning and/or food preparation always fall on the women in my department; Most of the academic advising responsibilities fall on women in my department; In my department certain roles are gendered in conversation (e.g., nurses are referred to as "she," doctors as "he," "chairman" rather than "chairperson"); The women in my department are not always addressed by their proper title (i.e., Dr. ____); Female faculty's clothing is noticed and commented on more than male faculty's clothing; People in my department are uncomfortable when women are outspoken; In my department, men and women are responded to differently when they display anger; Women are viewed as behaving inappropriately when they display anger; In my department, when women take charge, they are sometimes perceived as aggressive; In my department, expectations are inconsistent for men and women regarding collegiality; In my department, female faculty are more likely than male faculty to be asked questions that imply stereotypic gender roles (e.g., "who's taking care of your children while you're working or on call?"); When the women in my department or unit display assertiveness they are viewed negatively; People are uncomfortable when women lead initiatives in my department; Women in my department feel more pressured than men to take on service responsibilities; Women are asked to engage in more nurturing roles than men in my department because "they are good at it"; Women in my department are often treated with paternalism. Cronbach's alpha for the new scale was 0.95.

Mentoring

Upon examining the scree plot and total variance explained for mentoring, it was evident that one factor accounted for the majority of the variance at 51.4%. This first factor is relatively consistent with one of Schrodt, et al.'s (2003) sub-scales that they called *protection* (i.e., Help you to be more visible within your discipline; Use their influence within the department for your benefit; "Run interference" on your behalf when necessary; Protect you from situations or individuals that could have a negative impact on your career; Protect you from individuals who attempt to damage your progress towards tenure and promotion). It was determined that for this study, mentoring protection items most likely encompass the behaviors that a female protégé might need to be buffered from perceived discrimination. Thus, the ten items that did not load onto the *mentoring-protection* factor were dropped from further analyses. Items that were dropped are listed here: Offer assistance with publications and creative activity; Work on research projects and/or participate in creative activity with you; Edit your work and help you prepare manuscripts for presentation and publication; Socialize with you outside of the work environment; Socialize with you (e.g., have lunch, coffee breaks, social conversation, etc.) during work hours; Suggest specific strategies for achieving your career goals; Explain (i.e., help you learn about) the political realities of working at a college or university; Offer advice on tenure and promotion; Provide you support and encouragement; Seem trustworthy. Cronbach's alpha of the new scale, mentoring-protection, was 0.92.

Job Satisfaction

While Settles et al. (2007) described job satisfaction as having six dimensions (i.e., satisfaction with faculty interaction, resources and salary, being valued for scholarship and instruction, work–life balance, level of intellectual stimulation, and overall satisfaction), the scale was examined in past analyses as a global construct of satisfaction. When examining the factor analysis of the scale for this study's sample, a one-factor solution accounting for 41% of the total variance emerged. This single factor included items from a few of Settles et al. (2006) and Settles et al. (2007) six dimensions. Specifically, these items were: How satisfied are you with your position; Opportunity to collaborate with other faculty; Level of intellectual stimulation in my day-to-day contacts with faculty colleagues; Amount of social interaction with members of my unit/department; Current salary in comparison to the salaries of my colleagues; Balance between professional and personal life. The remaining seven items were dropped from further analyses. The items dropped are listed here: Level of funding for my research or creative efforts; Ability to attract students to work with me; Sense of being valued as a teacher by my students; Sense of being valued as a mentor or advisor by my students; Sense of being valued for my teaching by members of my department; Sense of being valued for my research by members of my unit/department; Sense of contribution to theoretical developments in my discipline. Cronbach's alpha for the new scale of job satisfaction was 0.85.

Employee Engagement

Upon a factor analysis of employee engagement, it appeared from the scree plot that the items were only loading onto two distinct factors instead of three that Schaufeli et

al., (2004) calls vigor (VI), dedication (DE), and absorption (AB). Two factors accounted for 53% of the variance and upon examining further, the first factor, accounting for 39% of the variance, included a blend of DE and VI (e.g., When I get up in the morning, I feel like going to work; At my work, I feel bursting with energy; My job inspires me.). It was determined that these two factors fit the current data best than those that Schaufeli et al. (2004) had found. In previous research Schaufeli et al. (2004) had found a noteably strong correlation between absorption and vigor and discussed how this makes sense given that "being fully immersed in one's activities goes along with high levels of energy and vice versa". On the contrary, this study showed a strong correlation between dedication and vigor. The second factor, accounting for 14% of the variance, remaned fairly consistent with what Schaufeli et al. (2004) identified as AB (i.e., When I am working, I forget everything else around me; Time flies when I am working; I get carried away when I am working.). The remaining four items that did not load onto the first two factors were dropped from further analyses.

The differences in this study's factor analysis results compared to those of Schaufeli et al. (2004) is most likely reflective of the sample used. While this measure had been previously used in organizations, an academic work setting is qualitatively different and may have led to these inconsistencies in factor loadings. In summary, two factors surfaced following a factor analysis of engagement – DE/VI and AB. Each were included in hypothesis testing as separate dependent variables and items that did not load onto these two factors were dropped from further analyses. Cronbach's alphas for DE/VI and AB were 0.90 and 0.85, respectively.

Departmental Engagement

One factor accounted for 76% of the variance in departmental engagement. This factor analysis and reliability coincided with Saks' (2006) previous research. No items were dropped from this measure.

After confirming that all reliabilities were acceptable, responses were averaged to form indexes representing each of the constructs mentioned above with higher scores indicating a higher degree of each (i.e., perceived discrimination, departmental engagement, mentoring-protection, job satisfaction, AB, DE/VI). Internal consistency reliabilities and correlations among all key variables and other survey items of interest are shown in Table 1.

<div align="center">3.2 Relationships between Variables</div>

As expected, perceived discrimination was negatively associated with job satisfaction, departmental engagement and DE/VI. In other words, the more female faculty perceived discrimination, the less satisfied they were, the less they were engaged in their department and the less they felt dedicated with and felt vigor towards their work. Additionally, mentoring-protection was positively correlated with job satisfaction, departmental engagement and DE/VI, such that the more mentoring support female faculty received, the more they felt satisfied, the greater their job satisfaction, engagement, dedication and vigor. It should be noted that absorption was not significantly correlated with either perceived discrimination or mentoring.

Knowing that significant correlations exist between the majority of this study's outcome variables and their antecedents, the next set of analyses were to test the study's

hypotheses, examining the independent and interactive contributions of perceived discrimination and mentoring on job-related outcomes.

3.3 Hypothesis Testing

Four hierarchical multiple regressions were used to test the unique and interactive contributions of the predictor variables. Specifically, job satisfaction, departmental engagement, AB and DE/VI were regressed on centered mentoring-protection relationships, perceived discrimination and their interactions. Interactions and subsequent analytic comparisons were tested in accordance with procedures outlined by Aiken and West (1991). Main effects were entered in Step 1, and the two-way interactions were entered in Step 2. Effects were interpreted at the step in which they were entered.

As expected, both perceived discrimination and mentoring-protection were significant predictors of job satisfaction and departmental engagement. More specifically, the greater participants' perceived discrimination, the lower their job satisfaction, departmental engagement and dedication/vigor. The greater their perceived mentoring-protection, the greater their job satisfaction and departmental engagement. DE/VI was not significantly predicted by mentoring-protection and AB was not predicted by either independent variables (i.e., perceived discrimination and mentoring).

Contrary to hypotheses, as shown in Tables 2-5, there were no significant interactions between perceived discrimination and mentoring-protection for any of the dependent variables. In other words, mentoring-protection did not moderate the relationships between perceived discrimination and the outcome variables.

CHAPTER 4 DISCUSSION

4.1 Contributions and Exploratory Findings

While previous research has been conducted to determine the effects of discrimination on job-related outcomes such as job satisfaction and engagement (Niemann & Dovidio, 1998; Settles et al., 2006; Settles et al., 2007; Low et al., 2007; Volpone & Avery, 2013; Dean & Fleckenstein, 2007; Steele, 1997; Steele et al., 2002), little known research has been conducted regarding the buffering effects of mentoring. To replicate and extend previous research, the current study examined whether mentoring-protection buffered the effects of perceived discrimination on both job satisfaction and engagement. The data supported significant, independent relationships that perceived discrimination and mentoring-protection have with the key outcome variables. These findings, while not novel, provide further evidence and support that a chilly climate not only still exists for some women in STEM departments, but that it also predicts negative job-related outcomes. These clear relationships between perceived discrimination and job satisfaction and engagement should be of concern to STEM areas of academia.

This study expected to find that mentoring-protection moderated perceived discrimination's negative effects on job satisfaction, departmental engagement and work engagement (i.e., AB, DE/VI). While the remaining discussion will describe many significant relationships between key variables, the main hypotheses of this study were

not supported. Specifically, mentoring-protection did not serve to buffer any negative relationships between perceived discrimination and the job-related outcomes of interest.

Additionally, absorption was not found to be related to perceived discrimination and mentoring. In fact, there were no strong correlations between absorption and any other measures in this study. Schaufeli et al. (2004) and Csikszentmihalyi (1990) note that absorption closely compares to the concept of 'flow' – "a state of optimal experience that is characterized by focused attention, clear mind, mind and body unison, effortless concentration, complete control, loss of self-consciousness, distortion of time, and intrinsic enjoyment" (Schaufeli et al., 2004, p. 75). Given that 77% of the respondents from this survey reported working at universities where promotions to full is awarded on the basis of research excellence, an inference could be made that absorption is closely related to the work of academic research (e.g., becoming engrossed in literature reviews, data analyses, research papers, etc.). The fact that absorption is not related to perceived discrimination could, on one hand, mean that women can "protect" their work from being impacted by a chilly climate; that is, perhaps chilly climate really does not affect the work that matters most. On the other hand, women who are able to be immersed in their work for long periods of time may choose to take their productivity elsewhere when they do not feel engaged and satisfied in other areas of their career. The latter results in a loss for academic departments that would be detrimental. More research would need to be conducted to determine exactly how female academics in STEM might maintain absorption in their career focus in spite of obstacles such as chilly climate.

It is also worth noting that the second engagement variable measured in this study – DE/VI – was not predicted by mentoring-protection, meaning protection behaviors

(provided through mentoring) failed to predict both engagement factors. This null finding might suggest that while mentoring-protection provides a person with increased satisfaction in their role and with their department, it may not lead to higher levels of engagement. We know from previous research that engagement is negatively related to turnover intentions and so academic deans and chairs who wish to fix turnover with mentoring should be cautioned as this does not seem to be a valid solution (Schaufeli & Bakker, 2004).

Despite finding no support for mentoring-protection as a buffer, exploratory analyses surfaced many noteable relationships between variables. Bivariate correlations showed an interesting phenomenon such that mentor support from men (whether it be career-specific or personal/emotional) is moderately-strongly correlated with perceived discrimination (negative), job satisfaction (positive) and departmental engagement (positive), and career-specific mentoring from men correlated with DE/VI (positive). Comparatively, personal support from women did not correlate with perceived discrimination, job satisfaction and DE/VI and correlated to a lesser extent with departmental engagement (positive). Career support from women, while significantly correlated with these key variables had less strong relationships than career support from men. These correlations suggest that career support from men in these male-dominated domains is strongly related to critical job-related attitudes. Future longitudinal research would help shed light on why this strong relationship exists. For example, it could be that support from men improves climate and job attitudes for women. Alternatively, it could be that women who are less sensitive to climate and feel happier at work seek more support from their male colleagues.

A few other findings not central to this study's hypotheses were observed. Perceived discrimination was moderately correlated with internal mentoring support such that the greater the perceived support within respondents' academic department, the less women perceived discrimination. Moreover, internal mentoring support was moderately-strongly correlated with job satisfaction and departmental engagement; and to a lesser extent, positively correlated to DE/VI. Notably, these correlations did not exist (either at all or as strongly) with external mentoring. This suggests internal mentoring relationships offer greater benefit for females working in STEM than having mentors outside their departments.

4.2 Limitations, Future Directions and Practical Applications

The study's correlational design, in which data were collected via survey from female professors at various universities, yielded some study limitations. Because this study was based on single-source, self-report data, there is a chance that common method variance drove significant relationships; and yet there are varying strengths of relationships including zero and so common method variance is not likely a major concern of this study (Podsakoff et. al, 2003). Self-report could also lead to memory biases because the survey questions were all retrospective. In addition, because this study is correlational and cross-sectional we can only get a snapshot of relationships rather than having any ability to establish cause. A longitudinal study would have been superior, but resources were limited. A number of extraneous variables may also have been present between participants (i.e., between universities, type of STEM field, etc.) for which were not controlled. Lastly, the sample was not as representative to the true population of females in STEM areas of academia because of the small sample size. This limitation

also led to underpowered analyses, and yet the significant correlations are impressive given the limitations on sample size. This survey had limited resources to incentivize participation and further research should consider creative ways to offer more valuable rewards for busy academics.

It is also worth noting that decisions to drop certain items from particulare measures may have reduced some of the constructs' scope and put the study at risk of measuring only a subset of what the scales were originally intended to measure. To see just how much this impacted results, post-hoc analyses were run with the original, full scales (used in the same way previous researchers used them), and the same results were found. The decision to drop items based on EFA resulted in more sound and reliable variables and did not appear to influence outcomes in any way. However, future research could continue discovering sound measures to be used in academia that measure the global constructs of mentoring, job satisfaction and work engagement.

While this study measured several other variables for exploratory purposes and found interesting relationships, future studies could consider fleshing out those findings with more data to find out specifically how those variables fit into the proposed model. One suggestion is to further explore the relationships between female faculty and male mentors and whether or not those relationships truly buffer the effects of perceived discrimination or operate via different mechanisms.

Another suggestion is to examine other potential factors related to absorption. This study only surfaced two significant relationships with absorption – DE/VI and total number of mentors. So what does predict absorption in one's work? And might

absorption predict career advancement within academia more than job satisfaction or other engagement constructs?

Although there were small significant relationships between total number of mentors and departmental engagement and absorption, the number of mentors female faculty reported having does not strongly correlate with the key variables in this study. The lack of strong relationships between total number of mentors and key outcome variables seems inconsistent with the concept of constellation of mentors (Higgins & Thomas, 2001; Higgins & Kram, 2001; Janasz &Sullivan, 2004). Further research could explore using a more effective measure for capturing the mentoring networks construct.

Mentoring programs are commonly implemented across organizations and academic universities alike (Borders et. al, 2011). Even institutions without a formal mentoring program, having a mentor is a common best practice for career development (Boswell & Irby, 2014). Theoretically, the idea of mentors makes sense – a person(s) to provide career and personal/emotional support in order to accelerate the protégé's career advancement. However, after examining the findings of this study, perhaps organizations rely too heavily on mentor programs to protect individuals from negative work environments. The results of this study cautions organizations from prescribing mentors as a fix-all for perceived discrimination. Mentoring programs may serve as a faulty patch in fixing a leaky pipeline. Perhaps organizations are addressing symptoms of the leaky pipeline and not the root problem.

This study's hypotheses were focused on how females can navigate the chilly climate to stay satisfied, engaged and achieve career advancement. However, ideally, the workplace would be free of such biases and discrimination and take appropriate action to

stay informed and interfere when subtle forms of discrimination manifest themselves. In that spirit, future research could be conducted to determine whether anti-bias/discrimination trainings have a significant impact on lowering the frequency of perceived discrimination, and thus increasing job satisfaction and engagement. It would also be interesting to see if an institution's culture plays a role in the outcomes of a chilly climate; specifically how "feedback-friendly" the organization is (Baker, 2013).

Although this research was not able to support mentoring-protection as a buffer between perceived discrimination and negative job satisfaction and engagement, it did highlight that mentoring is associated with more satisfied and engaged individuals. However, the entire context of a female professor's environment should be considered when looking for ways to aid in career advancement. It is difficult for female professors in STEM areas of academia to find job satisfaction, feel engaged in their department and in their work and ultimately advance into higher levels of professor status, because subtle forms of discrimination still exist.

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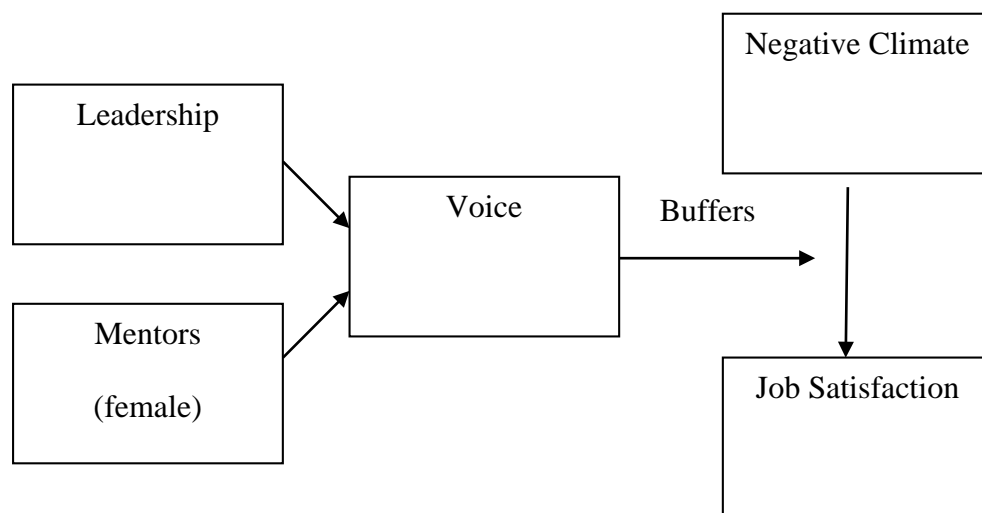
FIGURES

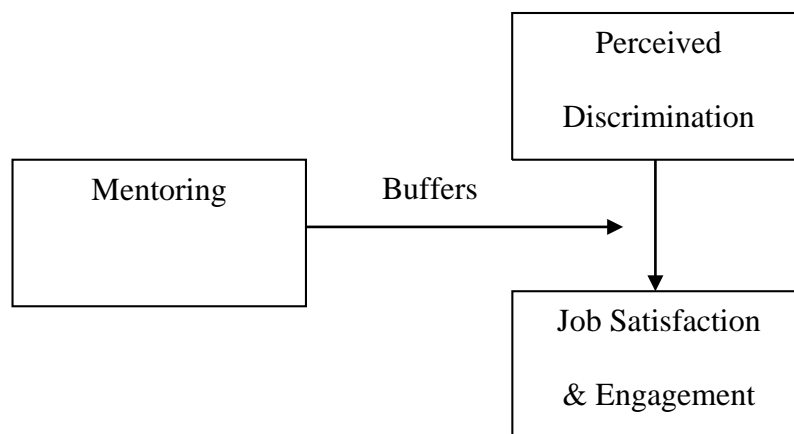Figure 1: Settles' et al. (2007) Conceptual Diagram of Proposed Relationships

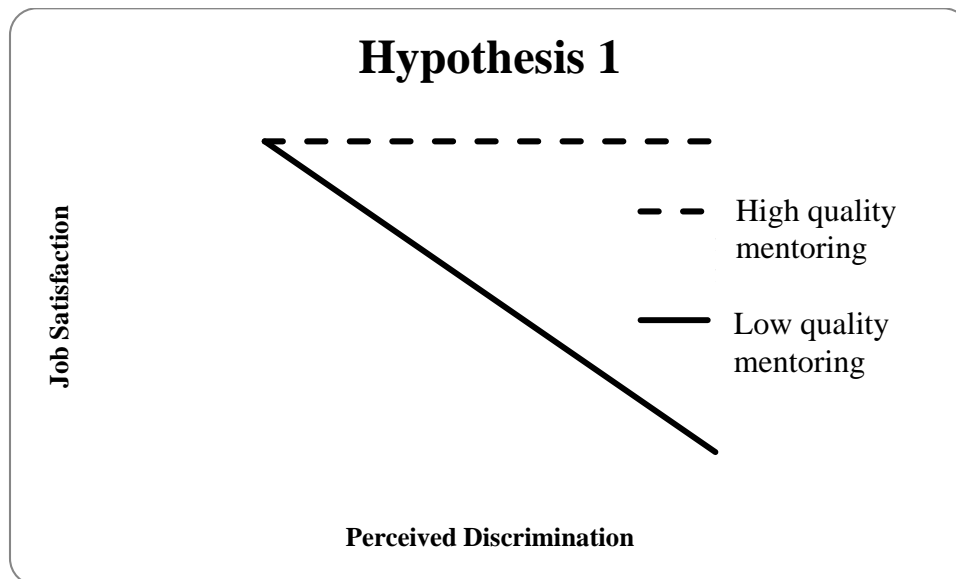Figure 2: Current Study's Proposed Relationships

Figure 3: Hypothesized Interactions between Mentoring and Perceived Discrimination as It Predicts Job Satisfaction
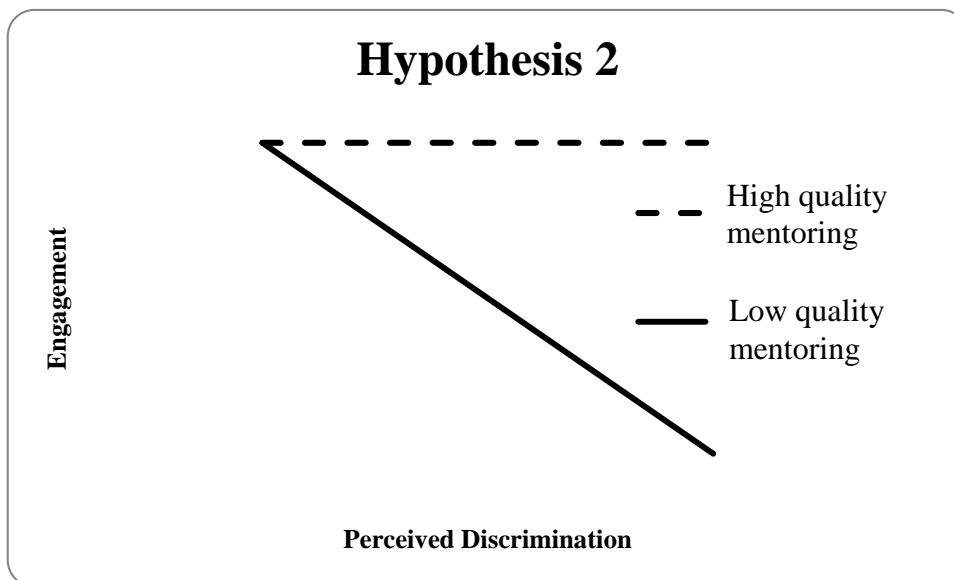

Figure 4: Hypothesized Interactions between Mentoring and Perceived Discrimination as It Predicts Engagement

TABLES

Table 1 Reliabilities and Correlations Among Variables

Reliabilities and Correlations Among Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Perceived Discrim.	(.95)																
2. Mentoring-protection	-35**	(.92)															
3. Job sat.	-63**	.56**	(.85)														
4. Dept. engage	-61**	.46**	.68**	(.94)													
5. DE/VI	-38**	.34**	.44**	.40**	(.90)												
6. AB	-02	-06	-08	.07	.32**	(.85)											
7. Informal ment.	-13	.19*	.11	.17	.02	-14	(1)										
8. Formal ment.	-22*	.51**	.37**	.21*	.21*	.04	-13	(1)									
9. Female ment.	-04	.01	.06	.06	-03	.16	.05	-03	(1)								
10. Male ment.	-28**	.26**	.24*	.30**	.13	.09	.13	-02	-12	(1)							
11. Total mentors	-20*	.16	.18	.22*	.05	.19*	.12	-04	.83**	.46**	(1)						
12. Female career support	-25**	.44**	.36**	.27**	.21*	-06	.24**	.40**	.43**	-19*	.27**	(1)					
13. Male career support	-44**	.66**	.46**	.38**	.31**	.06	.14	.42**	-19*	.53**	.13	.17	(1)				
14. Female personal support	-07	.38**	.27**	.26**	.08	-15	.26**	.15	.28**	-06	.22*	.61**	.09	(1)			
15. Male personal support	-40**	.46**	.49**	.39**	.21*	.17	.14	.27**	.03	.32**	.20*	.28**	.56**	.23*	(1)		
16. Internal ment.	-35**	.64**	.46**	.41**	.24*	-05	.25**	.39**	.08	.33**	.25**	.37**	.45**	.22*	.35**	(1)	
17. External ment.	-11	.24*	.21*	.28**	.20*	.01	.20*	.09	-13	.09	-07	.20*	.20*	.39**	.38**	-08	(1)
18. Token Woman	-13	-02	.09	-01	.03	.23*	.05	.04	.57**	-18	.41**	.28**	-10	.26**	.15	-00	-17
Mean	3.65	2.90	3.30	2.83	5.65	5.52	3.71	2.5	1.74	2.23	3.97	2.79	3.06	3.39	2.96	3.02	3.39
SD	1.64	.87	.86	1.02	.91	1.0	.98	1.10	2.40	1.51	2.69	1.13	1.07	1.21	1.17	1.07	.27

NOTE: Cronbach's alphas are presented in parentheses along the diagonal

**p<.01. *p<.05

Table 2

Hierarchical Regression for Variables Predicting Job Satisfaction

	B	SE B	β
Step 1			
Perceived discrimination	-0.366**	0.055	-0.543**
Mentoring-protection	0.184*	0.079	0.193*
Step 2			
Perceived discrimination	-0.375**	0.055	-0.556**
Mentoring-protection	0.175*	0.078	0.183*
Perceived discrim x Mentoring-protection	0.064	0.045	0.109

Note. Effects were interpreted at the step in which they were entered. $R^2 = .407$ for Step 1; $\Delta R^2 = 0.012$ for Step 2.
*p<.05. **p<.01.

Table 3

Hierarchical Regression for Variables Predicting Departmental Engagement

	B	SE B	β
Step 1			
Perceived discrimination	-0.329**	0.051	-0.527**
Mentoring-protection	0.195**	0.073	0.219**
Step 2			
Perceived discrimination	-0.331**	0.052	-0.529**
Mentoring-protection	0.193**	0.074	0.217**
Perceived discrim x Mentoring-protection	0.012	0.042	0.022

Note. Effects were interpreted at the step in which they were entered. $R^2 = .408$ for Step 1; $\Delta R^2 = 0.000$ for Step 2.
*p<.05. **p<.01.

Table 4

Hierarchical Regression for Variables Predicting AB

	B	SE B	β
Step 1			
Perceived discrimination	-0.014	0.062	-0.025
Mentoring-protection	-0.010	0.088	-0.013
Step 2			
Perceived discrimination	-0.004	0.062	-0.006
Mentoring-protection	0.000	0.088	0.001
Perceived discrim x Mentoring-protection	-0.079	0.050	-0.157

Note. Effects were interpreted at the step in which they were entered. $R^2 = .001$ for Step 1; $\Delta R^2 = .024$ for Step 2.
*p<.05. **p<.01.

Table 5

Hierarchical Regression for Variables Predicting DE/VI

	B	SE B	β
Step 1			
Perceived discrimination	-0.172**	0.051	-0.332**
Mentoring-protection	0.091	0.072	0.124
Step 2			
Perceived discrimination	-0.172**	0.051	-0.332**
Mentoring-protection	0.092	0.073	0.124
Perceived discrim x Mentoring-protection	-0.001	0.042	-0.003

Note. Effects were interpreted at the step in which they were entered. R^2 = .155 for Step 1; ΔR^2 = .000 for Step 2.

*p<.05. **p<.01.

APPENDICES

Appendix A: Perceived Discrimination Measure

1. Strongly disagree	2.	3.	4.	5.	6.	7. Strongly agree

1. I have heard jokes in my department about the kinds of roles that women are "suited for."

2. Tasks involving party planning and/or food preparation always fall on the women in my department.

3. Women in my department are assumed to lack know-how when it comes to computers/ technology.

4. Women (colleagues or students) have been addressed with terms like dear, honey, chick, or young lady in my department.

5. If female faculty members opt out of service-oriented tasks (e.g., committee work, student supervision, advising) they feel tension from other colleagues.

6. People in my department don't appreciate the reality of gender inequality.

7. Female faculty are often interrupted in meetings.

8. Women in my department often feel their voice/opinion is not heard.

9. Women in my department are hesitant to contribute ideas for fear of rejection.

10. Women in my department are expected to attend to students' educational or career guidance needs more than men are expected to do.

11. Women in my department have been left out of activities because they center around stereotypically male interests (e.g., sports, poker night).

12. Female faculty tend to have less influence within the department, regardless of their seniority or expertise.

13. Most of the academic advising responsibilities fall on women in my department.

14. In my department, certain roles are gendered in conversation (e.g., nurses are referred to as "she," doctors as "he;" "chairman" rather than "chairperson").

15. The women in my department are not always addressed by their proper title (i.e., Dr. ____).

16. In my department, women take on more assisting roles than leadership roles (e.g., in meetings, research initiatives).

17. Women in my department often don't get credit for their ideas.

18. Female faculty's clothing is noticed and commented on more than male faculty's clothing.

19. People in my department are uncomfortable when women are outspoken.

20. In my department, I have overheard sexualized comments about women.

21. In my department, men and women are responded to differently when they display anger.

22. Women are viewed as behaving inappropriately when they display anger.

23. In my department, when women take charge, they are sometimes perceived as aggressive.

24. In my department, expectations are inconsistent for men and women regarding collegiality.

25. In my department, female faculty are more likely than male faculty to be asked questions that imply stereotypic gender roles (e.g., "Who's taking care of your children while you're working or on call?").

26. When the women in my department or unit display assertiveness they are viewed negatively.

27. People are uncomfortable when women lead initiatives in my department.

28. Women in my department feel more pressured than men to take on service responsibilities.

29. Women are asked to engage in more nurturing roles than men in my department because "they are good at it."

30. Women in my department often treated with paternalism.

Appendix B: Mentoring Measure

1. Not at all	2. To a small extent	3. To some extent	4. To a large extent	5. To a great extent

Consider one or more individuals who have advanced experience and knowledge in your field (but need not be of higher status than you) who give you support, guidance, and advice for your career plans and interpersonal development. These can be individuals inside and/or outside your department.

To what extent do these individual(s)...

Research Assistance

1. Offer assistance with publications and creative activity.

2. Help you to be more visible within your discipline.

3. Work on research projects and/or participate in creative activity with you.

4. Edit your work and help you prepare manuscripts for presentation and publication.

Protection

5. Use their influence within the department for your benefit.

6. "Run interference" on your behalf when necessary.

7. Protect you from situations or individuals that could have a negative impact on
   your career.

8. Protect you from individuals who attempt to damage your progress towards tenure and promotion.

Collegiality

9. Socialize with you outside of the work environment.

10. Socialize with you (e.g., have lunch, coffee breaks, social conversation, etc.) during

work hours.

Promotion

11. Suggest specific strategies for achieving your career goals.

12. Explain (i.e., helps you learn about) the political realities of working at a

college/university.

13. Offer specific advice on tenure and promotion.

Friendship

14. Provide you support and encouragement.

15. Seem trustworthy.

Mentoring Demographics

16. How many women provide you with the mentoring functions listed above?

17. How many men provide with the mentoring functions listed above?

1. Not at all	2. To a small extent	3. To some extent	4. To a large extent	5. To a great extent

18. To what extent is support you receive from informal relationships?

19. To what extent is support you receive from formal relationships?

20. To what extent do you receive career-related support from women?

21. To what extent do you receive career-related support from men?

22. To what extent do you receive personal and emotional support from women?

23. To what extent do you receive personal and emotional support from men?

24. To what extent is the support that you receive inside your own academic department?

Appendix C: Job Satisfaction Measure

1. Very dissatisfied	2. Dissatisfied	3. Neutral	4. Satisfied	5. Very satisfied

Overall satisfaction

1. How satisfied are you with your position?

What is your overall satisfaction with the following dimensions of professional

development?

Faculty Interaction

2. Opportunity to collaborate with other faculty.

3. Level of intellectual stimulation in my day-to-day contacts with faculty

    colleagues.

4. Amount of social interaction with members of my department.

Resources and Salary

5. Level of funding for my research or creative efforts.

6. Current salary in comparison to the salaries of my colleagues.

Success as a Teacher

7. Ability to attract students to work with me.

8. Sense of being valued as a teacher by my students.

9. Sense of being valued as a mentor or advisor by my students.

10. Sense of being valued for my teaching by members of my department.

Success in Scholarship

11. Sense of being valued for my research by members of my unit/department.

12. Sense of contribution to theoretical developments in my discipline.

Work-Family Balance.

13. Balance between professional and personal life.

Appendix D: Engagement Measure

Never 0	Almost never 1 a few times a year or less	Rarely 2 once a month or less	Sometimes 3 a few times a month	Often 5 once a week	Very often 5 a few times a week	Always 6 every day

Vigor

1. When I get up in the morning, I feel like going to work.

2. At my work, I feel bursting with energy.

3. At my work, I always persevere, even things do not go well.

4. I can continue working for very long periods at a time.

5. At my job, I am very resilient, mentally.

6. At my job, I feel strong and vigorous.

Dedication

7. To me, my job is challenging.

8. My job inspires me.

9. I am enthusiastic about my job.

10. I am proud of the work that I do.

11. I find the work that I do full of meaning and purpose.

Absorption

12. When I am working, I forget everything else around me.

13. Time flies when I am working.

14. I get carried away when I am working.

15. It is difficult to detach myself from my job.

16. I am immersed in my work.

17. I feel happy when I am working intensely.

1. Strongly disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly agree

Departmental engagement

1. Being a member of this department is very captivating.

2. One of the most exciting things for me is getting involved with things happening in

   this department.

3. I am really not into the "goings-on" in this department (R).

4. Being a member of this department make me come "alive."

5. Being a member of this department is exhilarating for me.

6. I am highly engaged in this department.

Appendix E: Demographic Variables

1. Race/Ethnicity

1. White	2. Black	3. Asian	4. Native American	5. Hispanic	6. Other

2. Age

3. Organizational Rank

1. Assistant Professor	2. Associate Professor	3. Full Professor

Appendix F Thesis Proposal Document 2010

Does Mentoring Buffer Women in Science from the Effects of Perceived Discrimination

on Career Outcomes?

Fewer women are found in faculty positions in the areas of Science, Technology, Engineering, and Math (collectively termed STEM) than in any other area of academia (Dean & Fleckenstein, 2007). For example, women comprise 19% of tenure-track faculty in Engineering and Technology Schools and 20% of tenure-track faculty in the School of Science while comprising 40% of the tenure-track faculty in Liberal Arts at IUPUI (Informational Management and Institutional Research [IMIR], 2010).

The shortage of women in STEM makes the gender gap striking. Statistics from the National Science Foundation report that women comprise only 25.5% of full-time tenured or tenure-track faculty in science and engineering fields (NSF, 2006). Other sources estimate that although the proportion of men and women in medical school is fairly equal, the proportion of female medical school faculty has not changed since 1996 and is still well below that of male medical school faculty (Ley, 2008).

This gender gap in STEM begins after a Bachelor's Degree is earned and becomes progressively worse when examining higher degrees and tenure-track faculty positions. In other words, women in STEM faculty positions are underrepresented compared to the proportion earning degrees (Dean & Fleckenstein, 2007). More specifically, women earn 50.2% of science and engineering bachelor's degrees, while comprising 45.7% of master's degrees and 40.4% of doctorates in those same areas (NSF, 2007). Although women are earning 40% of doctoral degrees in science and engineering, they only consist of a quarter of the total workforce in those areas (Dean & Fleckenstein,

2007). For example, in 1999, women comprised only 29.1% of faculty members in the sciences and similar numbers have been found in workforce areas other than academia (Dean & Fleckenstein, 2007).This underrepresentation is even more pronounced when examining higher level faculty positions in STEM. According to 2006 NSF statistics, women occupy 40% of assistant professor positions, 31% of associate professor positions, and 16% of full professor positions specific to the sciences. In fact, most women remain at the assistant professor level in STEM fields (Mattis, 2007). Averaged over all STEM fields, other sources estimate women comprise half of the bachelor degrees in those areas, make up 37.5% of doctorate degrees, yet fill less than 13% of full professor positions (Dean & Fleckenstein, 2007). These estimations vary slightly from those mentioned previously because of a difference in samples.

A similar pattern has been found at IUPUI. Women comprise 20% of faculty positions in STEM areas at IUPUI. More specifically, women comprise 23% of assistant professors, 29% of associate professors, and 5% of full professors (IMIR, 2010). These statistics show that currently few women hold leadership positions at IUPUI in STEM areas. Dankoski (2010) makes a similar claim for women in the Indiana University School of Medicine (IUSM) in saying that the majority of women faculty are on non-tenure tracks, and remain at the assistant professor rank (Dankoski, 2010).

The phenomenon in which numbers of women decline as rank progresses has been termed the "leaky pipeline" (Burke, 2007). The progression of women earning a degree in STEM and advancing toward a full professor position in their field is comparable to a pipeline. At each stage of advancement, fewer women succeed to the next position – analogous to the "leaks" in the pipeline.

The Role of Gender Biases in the Leaky Pipeline

Various theories have attempted to explain why few female faculty in STEM are present in higher ranks. Some theories include the fact that there are small numbers of women in STEM fields initially; that work-family conflict may present a greater challenge for women than for men; that there may be actual gender differences in leadership ability, with men having an advantage over women; and that differences in women's preferences of work styles and goals lead them to select out of STEM (Wright, Schwindt, Bassford, Reyna, Shisslak, & Germain, 2003; Greenhaus & Beutell; Eagly & Carli, 2007; Sonnert & Holton, 1995). However, the explanation that has garnered the most recent attention is that of gender bias. The present paper will therefore focus on gender bias as a factor that may undermine women's success in STEM. Despite no evidence of being less capable than men in STEM fields, women are still stereotyped as less capable than men in both STEM fields and in leadership roles (Hyde, 2007).

These messages are conveyed in many ways and are often more subtle than one might expect when one imagines gender-based discrimination. Examples of such subtle behaviors are shared jokes that portray women in a negative light or assigning women to easier tasks that do not aid in career-advancement (Dean & Fleckenstein, 2007). Women faculty in the sciences are often seen as "girls" and are viewed as playing around – not doing real research (Kantola, 2008). Another example of a subtle discriminatory behavior would be assigning women vague goals. Among interviews with faculty in the sciences, more than three times as many women than men reported vague or unclear aspirations when they started (15.9% women versus 4.4% men) (Sonnert & Holton, 1995). These behaviors have been described in the literature in various ways: *micro-aggressions*, *subtle*

forms of discrimination, *everyday sexism*, *everyday prejudice*, and *interpersonal discrimination* (Swim, Hyers, Cohen, & Ferguson, 2001; Stangor, Swim, Van Allen, & Sechrist, 2002; Dean & Fleckenstein, 2007; Solorzan, Ceja, and Yosso, 2001).

Regardless of what those biases are termed, they occur with great frequency. Women in college report experiencing sexism at least one to two times a week and some even daily (Swim et al. 2001). In a faculty survey given at IUPUI, 25% of women in Engineering and Technology reported receiving negative or disparaging comments due to their gender, 20% reported experiencing offensive language or humor due to their gender, and 15% reported harassment and discrimination due to their gender (IMIR, 2009).

Not only do women in STEM perceive discriminatory comments often, but they are also provided fewer opportunities and more obstacles to their success (Sonnert & Holton, 1995). Specifically to faculty in academia, more women than men in the School of Science report the following due to their gender: feeling isolated or unwelcome (20.0% women versus 6.3% men); not being taken seriously (35.0% women versus 0% men); and discouragement in pursing academic goals (10.0% women versus 0% men) (IMIR, 2009). Similar results were found when examining women in engineering and technology disciplines (IMIR, 2009).

Women feel especially discriminated against when trying to go into male-dominated areas of work (Margolis & Fisher, 2002; Settles, Cortina, Malley & Stewart, 2006; Dean & Fleckenstein, 2007; Mansfield, Koch, Henderson, Vicary, Cohn, & Young, 1991). Settles, Cortina, Stewart, & Malley (2007) found that female faculty in the natural sciences (i.e., STEM areas) perceived significantly higher instances of sexual harassment, gender discrimination and a sexist climate than female faculty in the social sciences.

Niemann and Dovidio (1998) provide a possible explanation for why this occurs; women who are the only females in their department perceive they are the *token woman*. When women feel that there are no other people in their department like them, they tend to be more sensitive to acts of discrimination (Niemann & Dovidio, 1998). More specifically, Niemann & Dovidio (1998) found that individuals who were "solo" in their department (i.e., the only one of their race/ethnicity) reported higher levels of racial distinctiveness (including unequal treatment) than those minorities who had other people like them in their department.

Furthermore, due to the pervasive stereotypes regarding their ability in science and math and the fact that gender is more salient for women in male-dominated areas, women in STEM are at greater risk of experiencing *stereotype threat.* Roberson & Kulik (2007) define stereotype threat as a "psychological experience of a person who, while engaged in a task, is aware of a stereotype about his/her identity group suggesting that he/she will not perform well on that task," (p. 26). This internal process leads those who experience stereotype threat to perform poorly. Logel, Walton, Spencer, Iserman, von Hippel, and Bell (2009) found that women undergraduate students in math, science and engineering exposed to sexist cues performed significantly lower on a math test than women who were not exposed to sexist cues. Sexist cues did not affect women who took English tests (Logel et al., 2009). This finding exemplifies stereotype threat because the confederates make gender salient in the participants' minds right before taking a test, which triggers the stereotype about their identity – not being good at math. Ironically, employees who care about their work and really want to do well are the most likely to be affected by stereotype threat (Roberson & Kulik, 2007). The most talented and engaged

women are the most likely to experience stereotype threat because they are the ones most concerned with achieving high performance levels within the domain and find it self-relevant (Steele, Reisz, Williams, & Kawakami, 2007).

Not only do women experience discrimination and stereotype threat personally, but they may also witness discrimination directed at other women or observe artifacts within the organization that portray a prejudiced attitude. These indirect incidents can be referred to as *ambient discrimination*. For instance, a female faculty member in a Science department may only see pictures of male scientists posted along the hallway or hear her male colleagues talk down to another woman in the department. Research has found that workers' experiences with bystander harassment has incremental, negative consequences on the job and coworker satisfaction even after their personal experiences with discrimination, their affective disposition, and their ethnicity were taken into account (Low, Rhadhakrishnan, Schneider, and Rounds, 2007; Glomb, Richman, Hulin, Drasgow, & Schneider, 1997).

Collectively, experiences with and perceptions of discrimination, stereotype threat, ambient discrimination, etc. create a *chilly climate* for women in STEM and other male-dominated environments (Dean & Fleckenstein, 2007; Settles et. al, 2007). These negative experiences that women report (such as discrimination and bias) add up to hinder them from excelling in these areas (Sonnert & Holton, 1995).

<center>Consequences of Perceived Discrimination</center>

Women who experience discrimination and prejudice tend to report psychological distress including, "role conflict, devaluation, low self-esteem, lack of confidence, depression, discouraged achievement, victimization, dependency, and feelings of

helplessness" (p. 125, Nutt, 1999). Also, feelings of distress, lower comfort levels, high anxiety, and anger occur in women who experience a chilly climate (Swim et al., 2001). A meta-analytic study by Pascoe & Richman (2009) showed that studies on women who perceive discrimination have found that women tend to experience mental health problems, physical health problems, stress issues, and tend to have poor health behaviors (e.g., lack of sleep and exercise).

Ultimately, these negative feelings and health issues associated with a chilly climate lead to poorer job outcomes. Powell, Bagihole, and Dainty (2007) mention that women may be driven away by negative and harsh climates that create a dominant and masculine atmosphere. Aspects of a chilly climate (i.e., attitudes portraying bias, sexism, etc.) leave women feeling less satisfied and unable to achieve their full potential, affect promotions and often result in an exit from the field (Settles et al, 2007; Eagly, 2007; Roberson & Kulik, 2007; Powell, Bagilhole, & Dainty, 2007). Concerns about confirming a negative stereotype may distract women from optimal performance, causing them to disengage, and potentially disidentify with the area of interest (Dean & Fleckenstein, 2007; Steele, 1997; Steele et al., 2002). This study chooses to focus on job-related consequences for women who perceive discrimination in STEM.

Job Satisfaction

One particular negative job outcome related to perceptions of discrimination is job satisfaction (Settles et al., 2006; Settles et al., 2007). Job satisfaction has received so much attention because it has been established as a predictor of intentions to stay in one's job (Glomb et al., 1997; Higgins & Thomas, 1991; Sourdif, 2004). Job satisfaction is a global construct composed of a number of facets including satisfaction with pay,

supervision, coworkers, and promotional opportunities (Aamodt, 2007). Employees may be satisfied with one facet of their work, but not another.

A variety of factors have been found to be predictive of job satisfaction, several of which are similar to the experiences of women in STEM. People who do not enjoy working with their coworkers and supervisors have been found to be less satisfied with their job (Mossholder, Settoon, & Henagan, 2005). Additionally, the extent to which an employee perceives they are being treated fairly predicts job satisfaction (this judgment of equity is based on perceptions of the employee) (Aamodt, 2007). Finally, a lack of opportunity for growth and advancement has been shown to decrease satisfaction (Aamodt, 2007). Given that research has revealed similar phenomena among women in STEM, it seems reasonable to conclude that women in STEM who are high in perceived discrimination may experience decreased job satisfaction.

Indeed, research supports that women who experience a chilly climate at work report lower job satisfaction (Niemann and Dovidio, 1998; Settles et al., 2006; Settles et al., 2007; Low et al., 2007). This is of major concern because as mentioned previously job satisfaction tends to predict retention (Glomb et al., 1997; Higgins & Thomas, 1991; Sourdif, 2004). If women have low job satisfaction, they are less likely to remain in STEM fields. Thus, job satisfaction is a key outcome variable that will be measured in this study.

In order to focus job satisfaction towards specific facets that can be used to assess satisfaction for women in STEM, Settles et al. (2007) and Settles et al. (2006) conceptualized a more narrow construct of job satisfaction that assesses dimensions of professional development including satisfaction with faculty interaction, resources and

salary, being valued for scholarship and instruction, work–life balance, level of intellectual stimulation, and overall satisfaction with the current position at the university. This particular conceptualization will also be used in this study to estimate job satisfaction for women in STEM.

Engagement

A lesser studied job-related outcome of perceived discrimination, but one of interest in this study is *engagement*. Engagement can be defined as "a positive, fulfilling, affective-motivational state of work-related well-being" (Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002). Employees who are engaged tend to be enthusiastic about coming to work and identify strongly with their work. It is important to investigate engagement because it predicts job performance, which has obvious consequences for the success of women in STEM (Bakker, Schaufeli, Leiter & Taris, 2008).

Engagement has been found to arise from aspects of one's job, aspects of the organization, and aspects of the individual (Saks, 2006; Bakker, Schaufeli, Leiter, and Taris, 2008). Saks (2006) found that certain characteristics of the job (i.e., skill variety, task identity, task significance, autonomy, and feedback from Hackman and Oldham's (1980) job characteristics model) predicted only work/job engagement; procedural justice predicted only organizational engagement; and perceived organizational support predicted both work/job engagement and organizational engagement. Additionally, job engagement and organizational engagement mediated the relationship between the antecedents just mentioned and job satisfaction, organizational commitment, intentions to quit and organizational citizenship behavior (Saks, 2006). Similarly, Schaufeli and Bakker (2004) found that available job resources predict work engagement, and that work

engagement is related to turnover intentions; thus supporting work engagement's mediation between job resources and turnover intentions. Most relevant for the present research, climate has been found to be predictive of work engagement in a study by Hakanen, Bakker, & Schaufeli (2006), such that the more negative the climate, the less engaged are the employees.

Schaufeli et al. (2002) broke work engagement into three facets: vigor, dedication, and absorption. Vigor was defined as, "high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties," (Schaufeli et al. 2002, p.74). Schaufeli et al. (2002) described dedication as, "a sense of significance, enthusiasm, inspiration, pride and challenge," (p. 74). The last component of engagement is absorption, characterized by "being fully concentrated and deeply engrossed in one's work, whereby time passes quickly and one has difficulties with detaching oneself from work." (Schaufeli et al., 2002, p.75).

There has not been consistency in the literature as to whether to examine the three components of work engagement and their relationships towards other variables separately, or together as one factor of engagement. A number of studies have found the components to be highly correlated with one another (Schaufeli, et al. 2002; Bakker et al., 2008). However, other studies have found the three-factor model to fit significantly better than the one-factor model (Schaefeli, Bakker, & Salanova, 2006). Some have argued that the overall score for work engagement may be more useful in empirical research than the separate scores on the three dimensions (Schaufeli and Bakker, 2010). For the purposes of this study, the composite score of work engagement will be of focus. However, should

factor analysis reveal a more complex structure of engagement, each sub-factor will be examined individually.

<u>Mentoring Relationships as a Buffer from Perceived Discrimination in STEM</u>

Clearly, the leaky pipeline is a problem, and a way to increase female faculty in STEM areas needs to be identified. Several programs have been founded to look further into these gaps, verifying that the leaky pipeline is a nationally recognized problem. For example, there was a commission developed by the National Institute of Health (NIH) to examine best practices for sustaining women in biomedical careers ("Women in Biomedical Careers", 2010). The National Science Foundation (NSF) similarly funds many research projects on this subject area to learn more about how to retain women in STEM areas.

Many researchers have suggested using mentoring as a means of supporting and encouraging female faculty in STEM areas (Mendoza-Denton, 2002; Roberson & Kulik, 2007; Eagly & Carli, 2007; Settles et al., 2007; Ragins, Townsend and Mattis, 1998). Theoretically, mentoring has generally been a "good" intervention for employees. That is, it has been found to enhance employees' success in organizations. Eagly and Carli (2007) state "women gain from strong and supportive mentoring relationships and connections with powerful networks" (p. 70). O'Brien & Biga (2008) explain that "although differential access to mentoring may not be a cause of the glass ceiling, in some instances, mentoring may help overcome these barriers." (p. 549). This study will see if mentoring experiences provide a buffer from perceived discrimination for women in STEM areas.

Traditionally, mentoring has been conceptualized as dyadic (i.e., provided by one individual to one individual), but today people may have a constellation of mentors made up by their peers and supervisors (Higgins & Thomas, 2001; Higgins & Kram, 2001; Janasz &Sullivan, 2004). Constellations of mentors have been referred to as *developmental networks* (Higgins & Thomas, 2001; Higgins & Kram, 2001; Janasz &Sullivan, 2004). Rather than having one mentor, individuals tend to have multiple mentors for developmental support. Not only is this occurring more often in the workplace today, but it is more beneficial for the protégé (Janasz & Sullivan, 2004). For example protégés profit more from a variety of different mentors who each offer unique knowledge that will aid in their development as opposed to only one mentor offering advice (Janasz & Sullivan, 2004).

Whether dyadic or as a constellation, there are two general purposes of mentoring. Individuals may utilize mentoring to accomplish work-related tasks and goals, *career-oriented mentoring*, and/or they may develop relationships that provide emotional support, *psychosocial mentoring* (Ragins & Cotton, 1999; Kammeyer-Mueller & Judge, 2008; Allen, Eby, Poteet, & Lentz, 2004; Allen & Eby, 2004; Williams-Nickelson, 2009). Career functions serve to develop the protégé professionally and psychosocial functions provide emotional stability and social support.

The developmental network of employees that provide both career and psychosocial support to a protégé has been found to have positive outcomes similar to those found in traditional mentoring relationships (Belenky, 1986; Singh, Ragins, and Tharenou, 2009; Gilligan, 1982; Higgins & Thomas, 2001; Van Emmerick, 2004). In fact, others would argue that developmental relationships may provide even more of

these functions (Janasz & Sullivan, 2004). To expand, although both career and psychosocial functions can be met by one mentor in a dyadic relationship, it is difficult to provide each function to the protégé adequately. Instead, developmental network relationships allow the protégé to be provided with a wide array of these two functions from a variety of mentors (Janasz & Sullivan, 2004).

Mentoring relationships can be organized and set up, *formally*, or can occur naturally, *informally* (Ragins & Cotton, 1999; Wasburn, 2007; Ragins, Cotton, & Miller, 2000; Allen & Eby, 2004; Chao, Walz, & Gardner, 1992). The literature appears to be mixed as to which type is more effective; it may depend on the environment the mentoring relationship occurs. Generally few academic organizations have a formal mentoring process and more often informal relationships arise spontaneously (Janasz & Sullivan, 2001). This may be why many studies favor informal mentoring (Ragins & Cotton, 1999; Scandura & Williams, 2001; Williams-Nickelson, 2009), but some acknowledge that it may not be easy for women in STEM to develop those informal relationships because of the chilly climate (Settles et al., 2006).

Mentored individuals can experience a variety of positive effects. Mentoring outcomes can be divided into objective and subjective domains. Mentoring has been found to lead to the objective outcomes of promotion and increased income (Allen et al., 2004; Kammeyer-Mueller, 2008; Underhill, 2006; Dreher & Ash, 1990; Koberg, Boss, & Goodman, 1998). More subjective outcomes that have been found to be related to mentoring are situational satisfaction and attachment, interpersonal relations, motivation and involvement, decrease of psychological stress and strain, and reduced withdrawal behaviors, job satisfaction, and commitment (Eby et al., 2007; Allen et al., 2004;

Kammeyer-Mueller, 2008; Underhill, 2006; Dreher & Ash, 1990; Koberg, Boss, & Goodman, 1998). Studies have found that social support from colleagues, supervisors and the organization that can be gained from mentoring relationships predicts work engagement, another subjective outcome (Bakker & Demerouti, 2008; Bakker et al., 2008; Saks, 2006; Giblin & Lakey, 2010). Specifically, among the significant correlations Allen et al. (2004) found in their meta-analysis, the strongest were between mentoring and job satisfaction, expectations for advancement, career satisfaction, and promotions. Although subjective outcomes are more attitudinal they can be just as important because they tend to lead to objective outcomes (Allen et al., 2004). Further, although objective outcomes may seem more concrete, they are often contaminated with other factors such as the status of the company, economy, etc. (Allen et al., 2004). For these reasons, the current study will examine two subjective outcomes (i.e., job satisfaction and engagement) in relation to mentoring.

While the aforementioned studies show a direct relationship between mentoring and subjective career outcomes like job satisfaction and engagement, to date, the only study to examine the buffering effects of mentoring is Settles et al. (2007). Settles et al. (2007) proposed leadership and mentoring from females as means for women to achieve voice in the workplace. In addition, Settles et al. (2007) proposed voice to buffer the relationship between a chilly climate and job satisfaction such that the more voice women have from mentoring and leadership experiences, the less a chilly climate will affect their job satisfaction (see Figure 1). In fact, a significant interaction was found between voice and negative workplace climate in predicting satisfaction for women in nontraditional areas of academia (Settles et al., 2007).

Current Study

Similar to Settles et al. (2007), the current study will examine the effects of perceived discrimination, what Settles et al. (2007) terms a chilly climate, on job satisfaction, but adds an additional outcome variable of engagement. Additionally, rather than examining mentoring from females as a means to achieve voice which moderates the relationship between perceived discrimination and the outcome variables of interest, a number of mentoring relationships (i.e. developmental relationships) that involve both males and females will be examined as a direct buffer (see Figure 2). This study argues that developmental network relationships are a direct buffer between perceived discrimination and the outcomes of job satisfaction and engagement. (See Figure 3 and 4 for hypotheses in graphical form.)

Hypothesis 1: There will be an interaction between perceived discrimination and developmental network relationships predicting job satisfaction such that:

Hypothesis 1a: For women who report having few developmental network relationships, the higher they are in perceived discrimination the lower their reported job satisfaction.

Hypothesis 1b: For women who report having many developmental network relationships, perceived discrimination will not be predictive of job satisfaction.

Hypothesis 2: There will be an interaction between perceived discrimination and developmental network relationships predicting engagement such that:

Hypothesis 2a: For women who report having few developmental network relationships, the higher they are in perceived discrimination the lower their reported engagement.

Hypothesis 2b: For women who report having many developmental network relationships, perceived discrimination will not be predictive of engagement.

METHOD

Participants

Participants were female, tenure-track faculty members in the schools/departments of Science, Technology, Engineering, and Math at three large Midwestern universities. These women have the professor status of assistant, associate or full and all will hold doctoral degrees in their particular discipline. Focal outcome variables of perceived discrimination examined in a previous meta-analysis ranged in the small to moderate effect size (Pascoe & Richman, 2009). In order to have enough power to detect the interactions between perceived discrimination and developmental network relationships, a power analysis using G*power indicated a sample of 186 participants is needed to obtain a small to moderate effect size, while a sample of at least 240 is estimated by others (see Stone-Romero & Anderson, 1994). This study will aim for a sample of at least 200.

Measures

Perceptions of Discrimination. Thirty items will be used to measure everyday prejudice. Example items of perceived discrimination include, "Women in my department have been left out of activities because they center around stereotypically male interests", "Female faculty tend to have less influence within the department, regardless of their seniority or expertise," and "In my department, I have overheard sexualized comments about women." A list of all items is included in Appendix I. Responses will range from 1 (*strongly disagree*) to 7 (*strongly agree*). After reverse-

coding appropriate variables, higher scores will indicate higher perceived discrimination. These items were piloted by Williams and Ashburn-Nardo (2010) and have been found to have good psychometric properties (α=.96). These items had known groups validity such that responses differed between men and women in the school of science as expected (i.e., women reporting higher perceptions of discrimination). Furthermore, this measure was found to be correlated with a measure of procedural knowledge and belonging uncertainty such that the higher the perceptions of discrimination, the less participants knew how to succeed and the more they felt as though they didn't belong. These correlations are noteworthy because the pilot sample was rather small and yet theoretically sensible correlations emerged.

Developmental Network Relationships. Dreher and Ash (1990) created eighteen items that assessed graduate students' mentoring experiences (10 psychosocial items and 8 career-oriented items). Respondents were to consider their career history since graduating from the program and the degree to which influential managers have served as their sponsor or mentor (this need not be limited to one person). Since these items were intended for graduate students, this study will adapt this measure and ask respondents to "consider their career history since they started working as a faculty member in academia and indicate the extent to which individual/s (this need not be limited to one person) who had advanced experience and knowledge…'' had provided a variety of mentoring functions for them. Items will be specific to career-oriented functions (e.g., ''... given or recommended you for challenging assignments that presented opportunities to learn new skills?'') and psychosocial functions (e.g., ''... shared personal experiences as an alternative perspective to your problems?'') just as Dreher and Ash's (1990) original

items. Developmental network relationships will be assessed on a 5-point scale. Responses will range from 1 (*not at all*) to 5 (*to a great extent*). Items for Dreher and Ash's (1990) sample were reliable (α = .95). All items are included in Appendix I.

Job satisfaction. Participants' satisfaction with their jobs will be adapted from Settles' et al. (2007) 13-item measure which was partially adapted from the University of Michigan Faculty Work-Life Study (CSHPE & CEW, 1999). Participants are asked about their overall satisfaction with faculty interaction, resources and salary, being valued for scholarship and instruction, work-life balance, level of intellectual stimulation and overall satisfaction with the current position at the university. Sample items include, "opportunity to collaborate with other faculty," "level of intellectual stimulation in my day-to-day contacts with faculty colleagues," "level of funding for my research or creative efforts," "ability to attract students to work with me," and "sense of being valued for my teaching by members of my department." All items are included in Appendix I. Response scales will range from 1 (*very dissatisfied*) to 5 (*very satisfied*). Higher scores indicate more overall job satisfaction (α = .86).

Engagement. Employee engagement will be measured using an adapted 17-item measure developed by Schaufeli et al. (2002). Schaufeli et al. (2002) broke engagement down into three facets (i.e., vigor, dedication, and absorption). Sample items from each of the facets include, "When I get up in the morning, I feel like going to work," (vigor) "I am proud of the work I do," (dedication) and "When I am working, I forget everyone else around me," (absorption). Averaged over two samples the facets had the following reliability: vigor α=.74, dedication α=.91, and absorption α=.74; while the construct of

engagement was found to have α= 0.89. Responses will range from 0 (*never*) *to* 6 (*always*).

In addition, departmental engagement will be measured using an adapted version of Saks (2006) 6-item measure. Saks (2006) measured organizational engagement with the 6-item measure and rather than measuring organizational engagement, this study is looking to measure departmental engagement. Therefore, the word *organizational* will be replaced with departmental in each of the items. Sample items include, "Being a member of this department is very captivating," "One of the most exciting things for me is getting involved with things happening in this department," and "I am highly engaged in this department." Responses will range from 1 (*strongly disagree*) to 5 (*strongly agree*). Higher scores indicate higher organizational engagement (α=.90). All items of job/work and departmental engagement are located in Appendix I.

Demographic variables. Race/ethnicity, age, and organizational rank will be measured for descriptive purposes. Items are located in Appendix I.

<div align="center">Procedure</div>

This study utilizes a correlational, cross-sectional design. An email will be sent to all women faculty at three large Midwestern universities in the schools of Science, Technology, Engineering, and Math requesting participation in a study about attitudes and perceptions at work. The survey will be conducted through SurveyMonkey and participants will be provided a link to the survey. The survey will include measures of everyday prejudice, developmental network relationships, outcome variables of job satisfaction and engagement, as well as demographics and status rank. A fixed random order of questionnaires will be used in which items will be randomized within their

construct and then fixed for every survey. A reminder will be sent to all nonrespondents one week after the initial email. Survey responses will be voluntary and anonymous. In exchange for completing the study, there will be a lottery procedure in which individuals will be randomly selected to receive electronic gift cards.

<div align="center">Data Analysis</div>

Before analyzing the data, it is important to check for any violations of assumptions, outliers, or missing data. The appropriate exploratory analyses will be run (frequencies, means and standard deviations, histograms, kurtosis, etc.). It will be important to decide if any participants are invalid, inappropriate, or incomplete and delete them from the analyses (for example if a male happened to complete the survey). After cleaning the data, reliability will be assessed for all scales and a factor analysis will be conducted to examine the facets of engagement.

To test hypotheses, I will perform 2 hierarchical multiple regressions. Main effects will be entered in Step 1, and two-way interactions will be entered in Step 2. The variables used in the interaction will be centered to allow for a more accurate interpretation of the data (Cohen & Cohen, 1983). Effects will be interpreted at the step in which they were entered. The first regression will include perceptions of discrimination and developmental network relationships to be entered at Step 1, while the interaction term (developmental network relationships x perceptions of discrimination) will be entered at Step 2 to examine the ability of these variables to predict job satisfaction. The predictors will be entered at the same steps previously mentioned to examine the prediction of engagement.

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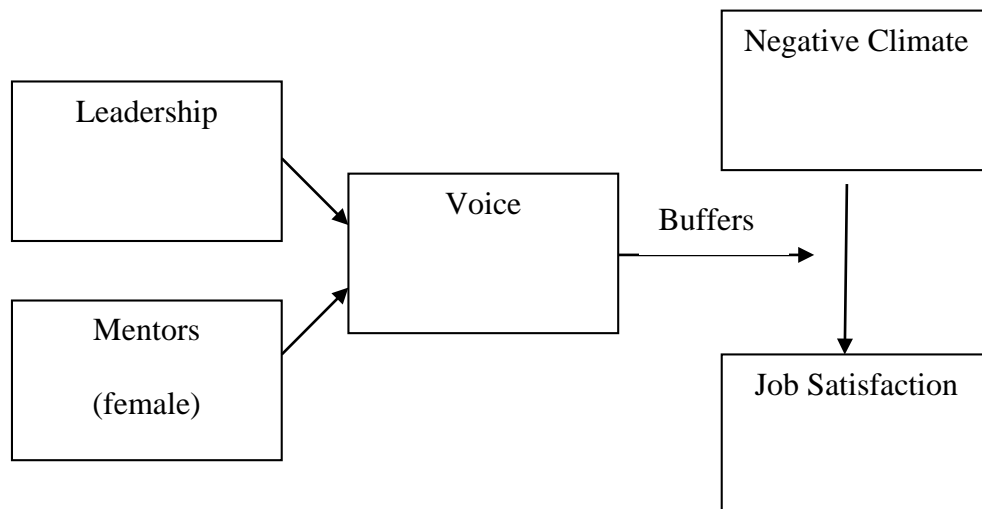
Appendix H: Proposal Figures

Figure 1: Settles' et al. (2007) Conceptual Diagram of Proposed Relationship

Figure From Settles' et al. (2007) Voice matters: Buffering the impact of a negative climate for women in science. *Psychology of Women Quarterly, 31*, 270-281.
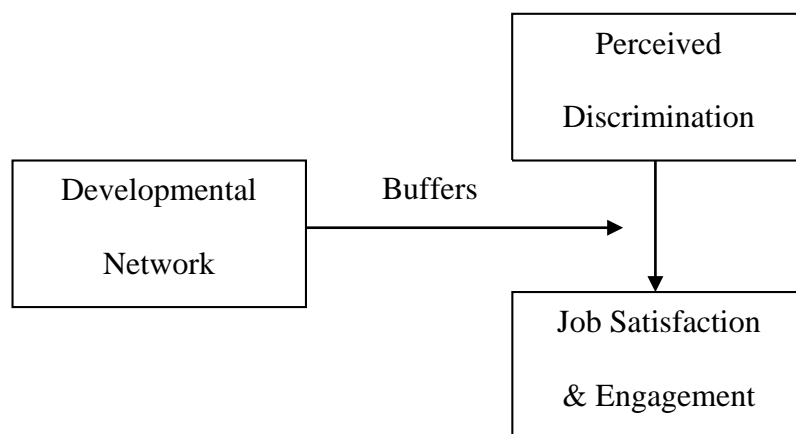

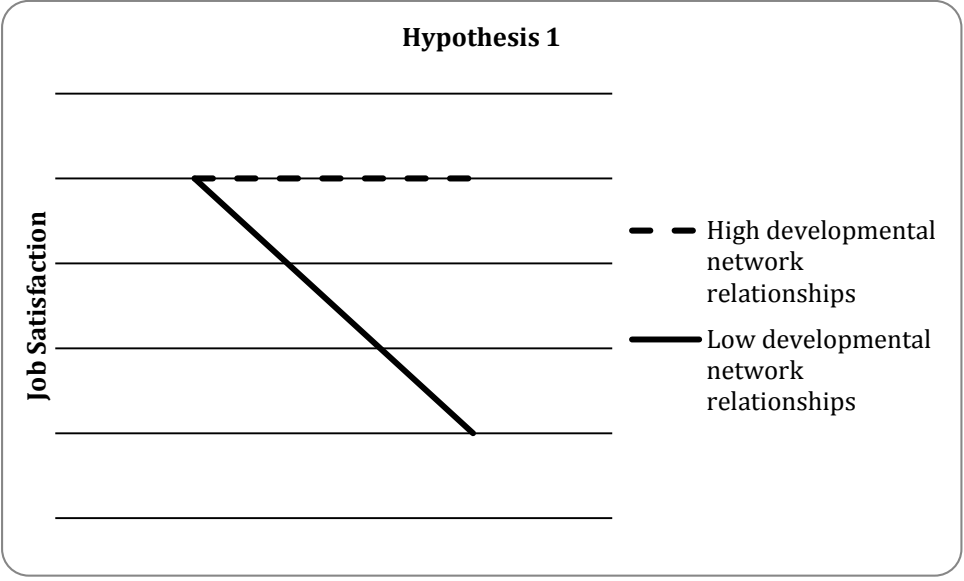Figure 2: Current Study's Proposed Relationships

Hypothesis 1

Job Satisfaction

- - High developmental network relationships

—— Low developmental network relationships

Figure 3: Hypothesized Interactions between Developmental Network Relationships and Perceived Discrimination as It Predicts Job Satisfaction
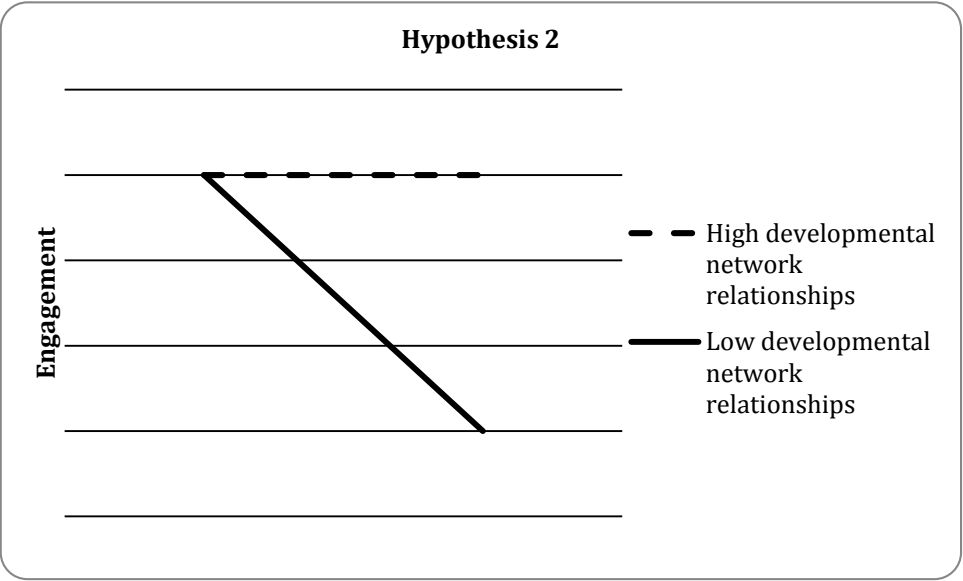
Hypothesis 2

Engagement

- - High developmental network relationships

—— Low developmental network relationships

Figure 4: Hypothesized Interactions between Developmental Network Relationships and Perceived Discrimination as It Predicts Engagement

Appendix I: Proposal Measures

Perceived Discrimination

1. Strongly disagree	2.	3.	4.	5.	6.	7. Strongly agree

31. I have heard jokes in my department about the kinds of roles that women are "suited for."

32. Tasks involving party planning and/or food preparation always fall on the women in my

department.

33. Women in my department are assumed to lack know-how when it comes to computers/ technology.

34. Women (colleagues or students) have been addressed with terms like dear, honey, chick, or young lady in my department.

35. If female faculty members opt out of service-oriented tasks (e.g., committee work, student supervision, advising) they feel tension from other colleagues.

36. People in my department don't appreciate the reality of gender inequality.

37. Female faculty are often interrupted in meetings.

38. Women in my department often feel their voice/opinion is not heard.

39. Women in my department are hesitant to contribute ideas for fear of rejection.

40. Women in my department are expected to attend to students' educational or career guidance needs more than men are expected to do.

41. Women in my department have been left out of activities because they center around stereotypically male interests (e.g., sports, poker night).

42. Female faculty tend to have less influence within the department, regardless of their

seniority or expertise.

43. Most of the academic advising responsibilities fall on women in my department.

44. In my department, certain roles are gendered in conversation (e.g., nurses are referred to as "she," doctors as "he;" "chairman" rather than "chairperson").

45. The women in my department are not always addressed by their proper title (i.e.,

Dr. ____).

46. In my department, women take on more assisting roles than leadership roles (e.g., in

meetings, research initiatives).

47. Women in my department often don't get credit for their ideas.

48. Female faculty's clothing is noticed and commented on more than male faculty's clothing.

49. People in my department are uncomfortable when women are outspoken.

50. In my department, I have overheard sexualized comments about women.

51. In my department, men and women are responded to differently when they display anger.

52. Women are viewed as behaving inappropriately when they display anger.

53. In my department, when women take charge, they are sometimes perceived as aggressive.

54. In my department, expectations are inconsistent for men and women regarding collegiality.

55. In my department, female faculty are more likely than male faculty to be asked questions

that imply stereotypic gender roles (e.g., "Who's taking care of your children

while you're working or on call?").

56. When the women in my department or unit display assertiveness they are viewed negatively.

57. People are uncomfortable when women lead initiatives in my department.

58. Women in my department feel more pressured than men to take on service responsibilities.

59. Women are asked to engage in more nurturing roles than men in my department because "they are good at it."

60. Women in my department often treated with paternalism.

Mentoring

1. Not at all	2. To a small extent	3. To some extent	4. To a large extent	5. To a great extent

Consider your career history and the degree to which influential people have served as

your sponsor or mentor (this need not be limited to one person).

To what extent has a mentor…

Career-Oriented Mentoring Items

1. Given or recommended you for challenging assignments that present opportunities to learn new skills?

2. Given or recommended you for assignments that required personal contact with administrators in different parts of the institution?

3. Given or recommended you for assignments that increased your contact with higher level administrators?

4. Given or recommended you for assignments that helped you meet new colleagues?

5. Helped you finish assignments/tasks or meet deadlines that otherwise would have been difficult to complete?

6. Protected you from working with other administrators or departments before you knew about their likes/dislikes, opinions on controversial topics, and the nature of the political environment?

7. Gone out of his/her way to promote your career interests?

8. Kept you informed about what is going on at higher levels in the institution or how external conditions are influencing the institution?

Psychosocial Mentoring Items

9. Conveyed feelings of respect for you as an individual?

10. Conveyed empathy for the concerns and feelings you have discussed with him/her?

11. Encouraged you to talk openly about anxiety and fears that detract from your work?

12. Shared personal experiences as an alternative perspective to your problems?

13. Discussed your questions or concerns regarding feelings of competence, commitment to advancement, relationships with peers and supervisors or work/family conflicts?

14. Shared history of his/her career with you?

15. Encouraged you to prepare for advancement?

16. Encouraged you to try new ways of behaving on the job?

17. Served as a role model?

18. Displayed attitudes and values similar to your own?

Job Satisfaction

1 Very dissatisfied	2 Dissatisfied	3 Neutral	4 Satisfied	5 Very satisfied

Overall satisfaction

14. How satisfied are you with your position?

What is your overall satisfaction with the following dimensions of professional development?

Faculty Interaction

15. Opportunity to collaborate with other faculty.

16. Level of intellectual stimulation in my day-to-day contacts with faculty colleagues.

17. Amount of social interaction with members of my department.

Resources and Salary

18. Level of funding for my research or creative efforts.

19. Current salary in comparison to the salaries of my colleagues.

Success as a Teacher

20. Ability to attract students to work with me.

21. Sense of being valued as a teacher by my students.

22. Sense of being valued as a mentor or advisor by my students.

23. Sense of being valued for my teaching by members of my department.

Success in Scholarship

24. Sense of being valued for my research by members of my unit/department.

25. Sense of contribution to theoretical developments in my discipline.

Work-Family Balance.

26. Balance between professional and personal life.

Engagement

Never 0	Almost never 1 a few times a year or less	Rarely 2 once a month or less	Sometimes 3 a few times a month	Often 5 once a week	Very often 5 a few times a week	Always 6 every day

Vigor

18. When I get up in the morning, I feel like going to work.

19. At my work, I feel bursting with energy.

20. At my work, I always persevere, even things do not go well.

21. I can continue working for very long periods at a time.

22. At my job, I am very resilient, mentally.

23. At my job, I feel strong and vigorous.

Dedication

24. To me, my job is challenging.

25. My job inspires me.

26. I am enthusiastic about my job.

27. I am proud of the work that I do/

28. I find the work that I do full of meaning and purpose.

Absorption

29. When I am working, I forget everything else around me.

30. Time flies when I am working.

31. I get carried away when I am working.

32. It is difficult to detach myself from my job.

33. I am immersed in my work.

34. I feel happy when I am working intensely.

1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree

Organizational engagement

1. Being a member of this organization is very captivating.

2. One of the most exciting things for me is getting involved with things happening in

   this organization.

3. I am really not into the "goings-on" in this organization (R).

4. Being a member of this organization make me come "alive."

5. Being a member of this organization is exhilarating for me.

6. I am highly engaged in this organization.

Demographic Variables

4. Race/Ethnicity

1 White	2 Black	3 Asian	4 Native American	5 Hispanic	6 Other

5. Age

6. Organizational Rank

1 Assistant Professor	2 Associate Professor	3 Full Professor