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FACTORS INFLUENCING THE RETENTION OF
WOMEN FACULTY IN STEM DISCIPLINES

By

Carrie J. Christensen
B.S., Centre College, 1999
M.S., Tennessee Technological University, 2002

A Dissertation
Submitted to the Faculty of the
College of Education and Human Development of the University of Louisville
In Partial Fulfillment of the Requirements
for the Degree of

Doctor of Philosophy
in Educational Leadership and Organizational Development

Department of Educational Leadership and Organizational Development
University of Louisville
Louisville, Kentucky

May 2018

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A Dissertation Approved on

April 4th 2018

by the following Dissertation Committee:

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DEDICATION

This work is dedicated to first to Lillian & Jacob: May you always follow your dreams!

And to Jeremy: Always.

ACKNOWLEDGMENTS

I would like to acknowledge and thank the Higher Education Research Institute at UCLA for providing me with access to the 2013 HERI Faculty Survey for this project. I would also like to thank my committee members, Dr. Jason Immekus, Dr. Meghan Pifer, Dr. Jeff Sun, and Dr. Amy Hirschy for all their input and assistance in this process. My dissertation chair, Dr. Jacob Gross, cannot be thanked enough for all the support and advice over the last five years! It has been an honor and pleasure working with you. There are so many others who contributed to this endeavor as well; I could never name them all, but you know who you are!

I couldn't have completed any of my educational goals throughout my life without the support of my family. Thank you to my parents; you never let me think there was anything I couldn't do because I was a girl. You supported and pushed me along the way to accomplish my goals. I may have taken a little longer to reach this goal, but I couldn't have gotten here without you. I love you both.

None of this would have happened without my best friend and partner, Jeremy. You never gave up on me or let me give up on myself; you had faith in me even when I didn't. Thank you for everything. And no, you are not contributing to my stress.

ABSTRACT

FACTORS INFLUENCING THE RETENTION OF WOMEN IN STEM DISCIPLINES

Carrie J. Christensen

April, 4th 2018

Low numbers of women faculty in STEM (science, technology, engineering and mathematics) disciplines continues to be a concern in higher education. Even though completion of STEM degrees by women has increased in many disciplines, increases in the number of women faculty have not been seen. Additionally, women continue to leave faculty positions at twice the rate of men. In order to remain globally competitive, the US needs to retain a diverse STEM professoriate. This dissertation examined the factors influencing the retention of women faculty in STEM disciplines and their over-representation in non-research intensive institutions.

The analysis was broken into two parts. Using the 2013 HERI Faculty Survey, the constructs faculty stress, job satisfaction, and intent to leave were first examined for faculty group differences based upon gender, discipline, and institution type using EFA and MIMIC analyses. In the second part, I examined the structural relationship between these three constructs using SEM techniques. Women faculty were found to be more stressed, less satisfied, and had greater intent to leave. Faculty stress had both direct and indirect effects on intent to leave with greater indirect effects occurring due to the mediation of job satisfaction. Ultimately, women faculty in STEM were more likely to

have intent to leave due to high levels of stress reducing their job satisfaction. In order to retain women faculty in STEM disciplines, institutions will need to examine their practices and policies to ensure women faculty are not being disadvantaged or discriminated based on their biology. By enabling women faculty to achieve a better work-life balance will not only increase their retention but will strengthen the entire professoriate.

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CHAPTER I INTRODUCTION

Introduction

In the United States, a thriving STEM workforce is crucial for continued innovation and global competitiveness (Engberg & Wolniak, 2013). While women hold almost one half of all jobs in the US economy, they only compose 24% of the STEM workforce (Beede et al., 2011; Diekman, Weisgram, & Belanger, 2015; Engberg & Wolniak, 2013). As a result of this deficit of women in STEM, the last three decades have seen extensive research about women in STEM. These studies have examined many different factors influencing the participation of women in STEM from the selection and completion of STEM bachelors and graduate degrees and their career choice.

In 2012, women earned 61% of all college degrees but only 42% of all earned college degrees were in STEM (NSF, 2015). While the number of women doctoral STEM degree recipients has increased 3% over the decade from 2002 to 2012, women earned 41% of all STEM doctoral degrees (NSF, 2015). Even with increased completion of STEM degrees the corresponding increases in women in STEM jobs has not occurred. A recent study found one out of every six PhD holders in STEM disciplines is employed outside of a STEM job (Turk-Bicakci & Berger, 2014) while Beede et al. (2011) have found only 26% of women who hold STEM degrees work in a STEM-related field.

Additionally, even though more women are earning doctoral degrees, studies have found women continue to be underrepresented in STEM faculty positions especially in prestigious (i.e., research intensive), tenured or tenure-track STEM faculty positions (Berggren, 2011; Canizares, 2009; Ceci & Williams, 2011; Duch, 2012; Easterly & Ricard, 2011; Lee, 2011; Kulis, Sicotte, & Collins, 2002; Morley, 2012; NAS, 2007; Nelson & Rogers, 2005; Silander, Haake, & Lindberg, 2012; Smith, 2011; Toutkoushian, 1999; Walters & McNeely, 2010).

Research Problem

Lower numbers of women faculty in STEM disciplines is a concern in higher education (Nelson & Rogers, 2006; Smith, 2011). Women who earn STEM degrees are more likely to work outside of a STEM field (Diekman et al., 2015; Beede et al., 2011; Turk-Bicakci & Berger, 2014). For higher education administrators, the recruitment of a diverse faculty in STEM disciplines is a challenge when less than 19% of individuals completing their PhD in STEM intend to pursue an academic career and another 19% leave STEM employment altogether (Turk-Bicakci & Berger, 2014). Although more women doctoral recipients than men plan on entering academia (20% versus 17% respectively), the number of women faculty for all disciplines has only increased 4% from 2004 to 2013 nationwide (NSF, 2015), and the recruitment and retention of faculty in STEM is a national concern (Callister 2006; Diekman, et al., 2015; Kaminski & Geisler, 2012; NAS, 2007; Xu, 2008a). The National Academy of Science found the number of women with advanced degrees in STEM is higher than the number of women applying for jobs at research intensive institutions (National Research Council, 2010), indicating women are not selecting to apply for these faculty positions. Of those that do apply, Kaminiski & Geisler (2012) found women still continue to be hired at lower rates

than men. Kulis, et al. (2002) examined patterns in the number of doctoral degrees earned in the 1970s and 1980s and the subsequent representation of women in faculty positions. They found, with the exception of health, biological sciences, and most social sciences, women were underrepresented in faculty positions, particularly in tenure-track positions. Nelson and Rogers (2005) found a significant disparity between the number of doctoral degrees earned by women in STEM disciplines and the number of women assistant professors during the decade between 1993 and 2000.

Many studies have examined the question of “why so few” in regards to women faculty in STEM disciplines and have found that women faculty in science face several challenges, including: lack of collegiality, isolation, discriminatory practices, marginalization, stereotyping, lower pay, fewer promotions, and lower tenure rates than their male counterparts (Beede et al., 2011; Nelson & Rogers, 2005; Rosser, S., 2004; Valian, 1999; Xu, 2008b). Two possibilities are often given for why women do not enter STEM positions: job preferences and limited opportunities. Some studies have shown hard science careers are more research-oriented and as a result tend to be isolating and competitive (Barbezat, 1991), and suggest women may prefer teaching over research and the increased collegiality present in less research-intensive environments. It is then hypothesized women faculty, including women in STEM disciplines, are self-selecting into non-research intensive faculty positions to avoid the isolation and competitiveness found at research intensive institutions (CITATION).

Increasing the number of women faculty in STEM disciplines has the potential to address some of these issues by creating a more welcoming environment, and increasing the rate of future women faculty hired. This increase will also strengthen the

metaphorical STEM pipeline by increasing the number women faculty available as mentors to provide support and inspiration for women students in these disciplines (Blake-Beard et al., 2011; Carrigan, Quinn, & Riskin, 2011; Ragins & Scandura, 1994; Tolbert, et al., 1995; Turk-Bicakci & Berger, 2014). Future numbers of women faculty in STEM disciplines will not increase without the completion of baccalaureate and graduate degrees by women in these disciplines, and one of the most important predictors of undergraduate women's success is the percentage of women faculty (Trower & Chait, 2002). As a result, the repercussions of women faculty in STEM continuing to leave academia at twice the rate of men (August & Waltman, 2004; Callister, 2006; Ceci et al., 2009; Seifert & Umbach, 2008; Trower & Chait, 2002) go beyond the professoriate and impact the entire STEM pipeline.

Purpose of Study

Due to the continued underrepresentation of women in STEM faculty positions the purpose of this study was to examine factors influencing the retention of women faculty in these positions. Developing a better understanding of why women are less likely to select and/or are less likely to be retained in faculty positions will enable higher education administrators to develop recommendations for policies and practices to increase retention of women faculty in these positions. To accomplish this goal, I developed four research questions (RQ) to examine the factors influencing faculty retention. To address these questions, the study consisted of two parts. First, differences in faculty perceptions of stress, job satisfaction, and intent to leave were examined to better understand the effects of gender, discipline, and institution type on these perceptions (RQ 1, 2, & 3). This examination was based upon an earlier study illustrating differences in faculty perceptions of stress among faculty groups based on gender and

race (Dey, 1994). This methodological framework was used to examine differences in faculty groups based upon gender, discipline, and institution type. While significant research has been performed examining faculty job satisfaction and intent to leave, studies using the equivalent methodology to Dey (1994) on the constructs of job satisfaction or intent to leave were not identified in the literature and represent a significant gap in our knowledge.

After examination of group differences in faculty perceptions on each of these constructs (RQ 1-3), the structural relationship between faculty stress, job satisfaction, and intent to leave was examined in the second portion of this study. Previous literature as discussed in Chapter 2 has shown significant interactions between the constructs of faculty stress, job satisfaction, and intent to leave, but rarely has examined the relationship between all three. This study generated a structural model of faculty stress, job satisfaction, and intent to leave then examined the effects of gender, discipline, and institution type on this relationship (RQ 4).

Research Questions

Research Question 1. Do faculty differ in their perceptions of stress based upon their discipline, gender, and institution type?

Research Question 2. Do faculty differ in their perceptions of job satisfaction depending upon their discipline, gender, and institution type?

Research Question 3. Do faculty differ in their intent to leave academia depending upon their discipline, gender, and institution type?

Research Question 4. Are there structural differences in the relationship between stress, job satisfaction, and intent to leave based upon faculty gender, discipline, or institution type?

Significance of Study

Even though the numbers of women graduating from certain STEM disciplines has reached parity or in some disciplines (e.g., life sciences) has exceeded the rate of men, studies have shown women faculty in STEM disciplines leave faculty positions at twice the rate of men (August & Waltman, 2004; Callister, 2006; Ceci et al., 2009; Seifert & Umbach, 2008; Trower & Chait, 2002). This loss of women from the professoriate has several ramifications. First, institutions invest time, money, and resources into the recruitment of faculty, and turnovers are costly for the institution (Daly & Dee, 2006). Often faculty leaving the institution are faculty the institution wants to retain for various reasons including their prestige and research productivity. In STEM disciplines the institutional cost of recruitment of faculty often includes laboratory space and research startup funding. Department structure fluctuation, as a result of faculty attrition, impacts the social and research dynamics of the department as well as availability of faculty to teach classes, especially higher level classes that have greater disciplinary specificity. The loss of these faculty from an institution therefore is a loss of additional institutional investment.

Second, the loss of women from a discipline or department represents a loss of valuable diversity. Faculty diversity is critical to support a diverse student population. The lack or reduced number of women in a discipline or department means fewer mentors for women students, and has the potential to reduce the persistence of these students through their program of study.

Finally, the loss of any faculty member leads to increased curricular changes and the resulting increased administrative workloads for both the program and departmental leadership. This loss of women faculty is likely to have greater impact on other women

faculty within the department due to the greater probability the remaining women will either be asked to shoulder the burden left by the parting faculty, or volunteer to take on the additional service (Bellas & Toutkoushian, 1999).

This study was designed to examine potential factors influencing faculty intent to leave based upon their gender, discipline, and institution type. The results of this study provide insight to administrators, assisting them with policy development in order to not only recruit a more diverse professoriate, but to better retain those faculty they have spent time and resources to bring into their institution. Increasing the retention of women faculty in STEM disciplines will serve to not only increase the participation of women in academia, but will also help to strengthen the competitiveness of the US globally through the development of a larger, more diverse workforce.

The subsequent chapters are outlined as follows: Chapter 2 will examine the theoretical framework guiding this study and review the literature in regards to faculty intent to leave, job satisfaction, and stress. Chapter 3 examines the methodology used to address each of the four research questions posed in this study. The results of this analysis will be presented in Chapter 4, and Chapter 5 will discuss the findings of the study and their implications.

CHAPTER II REVIEW OF THE LITERATURE

Introduction

This study examined the factors influencing the retention of women in STEM faculty positions in higher education. To better understand these factors, including the factors behind their lower faculty representation and higher attrition rates, this chapter first reviews the history of women in higher education and in STEM disciplines to establish the basis for the theoretical framework and faculty group selection for the study. Next, it examines the theoretical framework of the study, and finally, examines the literature regarding faculty stress, job satisfaction supporting why they were selected as predictors faculty for intent to leave.

Women in Higher Education

Since the founding of Harvard in 1636, which established higher education in the US, women have faced many challenges to gaining equality within higher education (Rosser, S., 2004; Solomon, 1985). The initial challenge to women was access. It took over two hundred years of higher education in the US before women were granted admission into these institutions. By the 1860s, there were only 14 institutions in the US granting admission to women (Thelin, 2004), with Oberlin College regarded as the first to admit women in 1833, followed by the establishment of the all-women Mount Holyoke in 1837. The 1840s and 50s saw an increase in the establishment of normal schools in

order to educate more women as teachers; education was, even early on, a profession deemed appropriate for women (Thelin, 2004).

The decades after the Civil War saw a period of expansion for higher education. While access to coeducational institutions increased, women continued to be segregated not only within institutions, but were most often segregated to specific courses and programs offered such as normal schools to train educators (Thelin, 2004). This period also saw the establishment of the Seven Sisters (Mount Holyoke (1837), Vassar (1865), Smith (1875), Wellesley (1875), Radcliff (1879), Bryn Mawr (1885), and Barnard (1889)). These all-women institutions were classified as coordinate colleges to the prestigious, male Ivy League institutions and served as a way for these institutions to be some of the last in the US to admit women into their programs (see Table 1). These most prestigious institutions continued to exclude women until the 1970s.

Table 1 The Ivy League institutions in the US, year founded, year women fully admitted, and coordinate institution

	Year Founded	Year Women Admitted	Coordinate College
Harvard	1636	1975	Radcliff (now part of Harvard)
Yale	1702	1969	Vassar (now coeducational)
UPenn	1740	1954	College for Women at UPenn
Princeton	1746	1969	Bryn Mawr
Brown	1746	1971	Pembroke
Columbia	1754	1983	Barnard
Dartmouth	1769	1972	Mt. Holyoke
Cornell	1865	1870	Sage College

As more women gained admission into higher education institution, feminization became a common concern among the men who were in control of these institutions during this time (1860 – 1920). These men argued there were harmful effects of

increasing numbers of women in higher education including increased numbers of women would drive men out of the classroom or distract them while in it (Solomon, 1985). Devaluation of courses or programs occurred when insufficient numbers of men were enrolled. This resulted in women being relegated by the primarily White, able-bodied, men in charge of these institutions to appropriate disciplines such as education or home economics. Women also faced discrimination even after they completed their degrees due to job market discrimination and family-versus-career decisions (Solomon, 1985).

In some regards much has changed in the past 200 years of higher education in the US, while in other ways much remains the same. Today, women earn the majority of both bachelors and masters degrees in the US (Figure 1). Over the last decade (2004 – 2014), the percentage of bachelors degrees earned by women has remained steady and outpaced degree earning by men. Women also earned significantly more masters degrees during this decade than men, but continue to earn less than half of all doctoral degrees awarded in all disciplines (Figure 1).

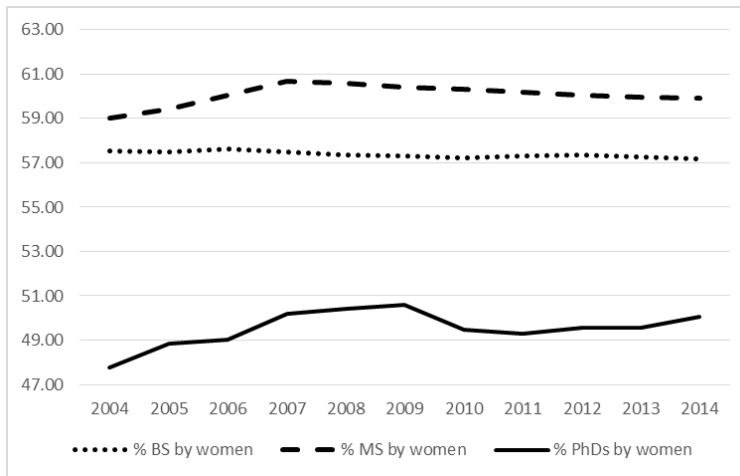


Figure 1. Percentage of women earning bachelors, masters, and doctoral degrees for all disciplines from 2004 to 2014 based upon data from National Science Foundation, National Center for Science and Engineering Statistics. 2017. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017*. Special Report NSF 17-310. Arlington, VA. Available at www.nsf.gov/statistics/wmpd/.

There are differences in this pattern of degree earning when the percentage of degrees awarded in STEM disciplines is examined (Figure 2). The percentage of women earning bachelor's degrees in STEM remained steady throughout much of the period of 2004-2014, with women earning half of all bachelor's degrees in STEM disciplines. However, this rate is lower than the overall rate of women earning all bachelor's degrees. While women earned almost 60% of all master's degrees in all disciplines, they earned less than half of all master's degrees in STEM disciplines. Women also earned fewer doctoral degrees in STEM disciplines compared to overall doctoral degrees. Since 2010, there has been a slight trend in increasing numbers of master's and doctoral degrees being awarded to women in STEM (Figure 2).

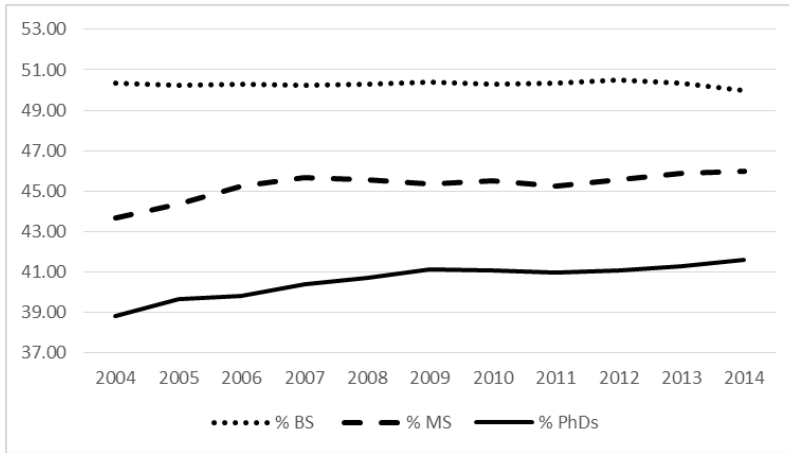


Figure 2. Percentage of women earning bachelors, masters, and doctoral degrees in STEM disciplines from 2004 to 2014 based upon data from National Science Foundation, National Center for Science and Engineering Statistics. 2017. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017*. Special Report NSF 17-310. Arlington, VA. Available at www.nsf.gov/statistics/wmpd/.

Examination of doctoral degree attainment patterns across four major STEM disciplines over the last decade shows distinct patterns. Life sciences are the only disciplines where women have exceeded men in the rate of doctoral degree attainment. In the remaining disciplines, while the completion of doctoral degrees by women has increased, it remains lower than the degree attainment by men (Figure 3).

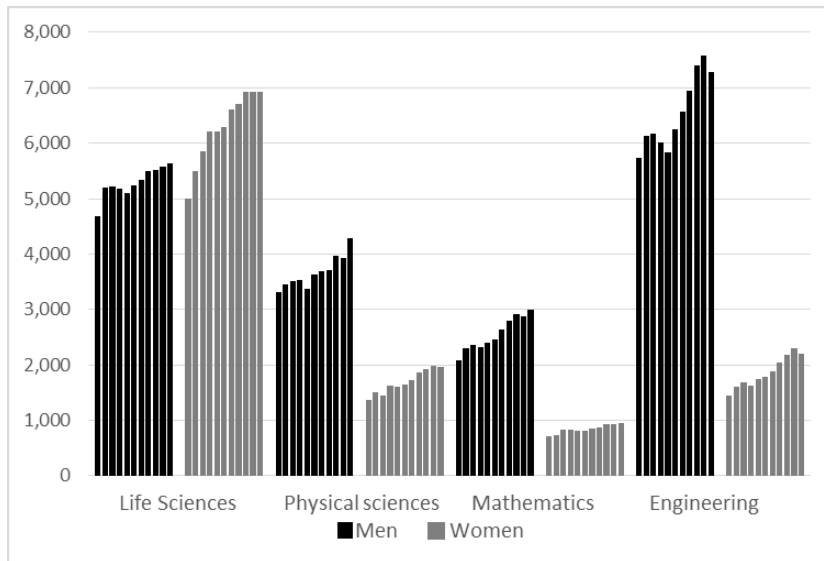


Figure 3. Comparison of men and women earning doctoral degrees in STEM disciplines from 2006 - 2016 based upon data from National Science Foundation, National Center for Science and Engineering Statistics. 2017. *Doctorate Recipients from U.S. Universities: 2016*. Special Report NSF 18-304. Available at www.nsf.gov/statistics/2018/nsf18304/.

Although in many cases, such as in the life sciences, the rate of doctoral degree completion has increased, the corresponding increases in women in faculty positions has not occurred (Finkelstein, Conley, & Schuster, 2016; Trower & Chait, 2002). The number of women overall in the professoriate has fluctuated over the last decade, with women most frequently composing the minority (Figure 4). Finkelstein, Conley and Schuster (2016) found women only made up 35.9% of faculty in 2006. They also found women were better represented at colleges and 2-year institutions and in the arts and humanities disciplines, while they were under represented in full time tenure track positions and in certain STEM disciplines (2016). They also found, in 2013, there was an increase in the number of women in full time, non-tenure track, and in part-time positions. Additionally, at research intensive institutions, men outnumbered women 2.5:1

in tenure track positions, while women outnumbered men in tenure track positions at 2-year institutions.

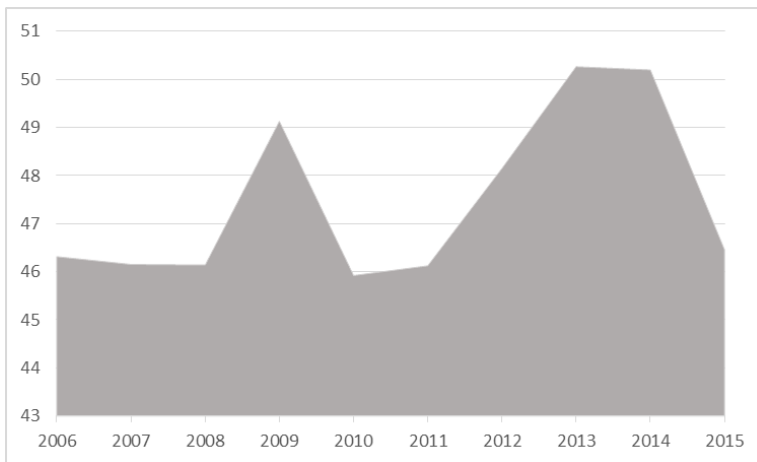


Figure 4. Percentage of women in post-secondary teaching positions from 2006 to 2015 based upon data from National Science Foundation, National Center for Science and Engineering Statistics. 2017. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017*. Special Report NSF 17-310. Arlington, VA. Available at www.nsf.gov/statistics/wmpd/.

There are several possible explanations as to why these persistent patterns of fewer women faculty in specific disciplines, and women more concentrated at what are often considered “less prestigious” institutions including non-research intensive and 2-year institutions. Trower and Chait (2002) found while numbers of women qualified for faculty positions had increased, women found academia to be unaccommodating, uninviting, and unappealing. Schneider (2000, p A12) stated “liberal arts colleges [i.e., non-research intensive institutions] provide a better place for women to thrive” when she reported on why women are less likely to be faculty at research intensive institutions. These authors suggest women are self-selecting these institutions. Rosser (2004) disagrees with this theory, claiming the assumption non-research intensive institutions are more supportive to women faculty may, in fact, be an illusion. She states women in these

institutions have greater teaching loads, more campus expectations, and lack access to graduate students increasing course preparation. This results in these faculty having decreased research productivity leading to lower rates of advancement. Therefore, there may be reasons other than free choice contributing to the concentration of women faculty in non-research intensive institutions.

One reason for the reduced numbers of women faculty in research intensive institutions is the presence of institutional barriers. Several institutional barriers women at research intensive intuitions face have been identified including: decreased lab space, lower salaries, and fewer prestigious opportunities (Park, 1996; Rosser & O'Neil Lane, 2002; Walters & McNeely, 2010). In her review of “women’s work” in higher education Park stated women faculty have less office and lab space, fewer graduate assistants, and fewer services from support staff (1996). Rosser’s (2004) qualitative study of women scientists identified four areas of institutional barriers needing to be addressed. The most often cited concern for these women was balancing work and family. While this is a challenge for women faculty in any discipline (as well as men), women scientists faced greater challenges in work-life balance due to the increased competitiveness and inflexibility of STEM disciplines. This is further exacerbated due to the frequent alignment of biological and tenure clocks.

The second barrier identified by Rosser (2004) was the low number of women in STEM disciplines resulting in stereotyping. This leads to differences in performance evaluation, isolation, lack of mentoring, and difficulty gaining credibility. Small numbers of women in any department, discipline, or institution has the effect of making those women highly visible and as a result increases the attention focused on them often

resulting in heightened expectations and performance standards (Rosser & O'Neil Lane, 2002; Tolbert, et al., 1995). Although this increased attention may highlight a woman's successes, it also amplifies their struggles and failures. Williams and colleagues (2006) found the presence of recall bias in higher education where the mistakes made by women are remembered longer than the same/similar mistake made by a man. This increased visibility and heightened memory of a negative incident impacts an individual's academic career.

Also when numbers of women within a discipline are low, women faculty are more likely to experience isolation due to the lack of mentoring by senior or more experienced women, and are expected to serve on more committees and advise more students (Park 1996). This increased pressure on their time experienced by women faculty increases their stress (Dey, 1994), and decreases their job satisfaction (Hagedorn, 1996; Smart, 1990) increasing their intent to leave (Rosser, 2004). Critical mass theorists have shown a larger proportion of women in an institution has the potential to create a more welcoming work environment for women faculty (Carrigan, Quinn, & Riskin, 2011; Etzkowitz, et al., 1994), so the continued low numbers of women faculty in certain disciplines, especially certain STEM disciplines, will continue to create an environment within which women will not thrive. Carrigan, Quinn, and Riskin (2011) examined the number of women in STEM disciplines and the impact on job satisfaction, and found women in a STEM discipline with a critical mass of women (defined as minimum 15%) had increased job satisfaction. Interestingly, men in STEM disciplines with a critical mass of women exhibited decreased job satisfaction. While they predicted decreased job

satisfaction in women in disciplines without critical mass would be more likely to leave, this study did not measure faculty intent to leave as a result of this dissatisfaction.

With the exception of the biological sciences, most STEM disciplines have remained male dominated. Kanter (1977) proposed the initial entry of women into male-dominated disciplines would result in decreased collegiality within the department, but stated as numbers of women increased and their group visibility decreased, conditions would likely improve. This theory is supported by the finding of Carrigan and colleagues (2011) where men in STEM disciplines with a critical mass of women were less satisfied than men in STEM disciplines with fewer women. Kanter also stated when resources are limited, social groups (or in this case, faculty groups) compete for resources and while a group is in the minority they are not perceived as a threat to the availability of resources, but as minority group numbers increase (e.g., numbers of women increase), competition and negativity will increase between the groups (1977). This competition for limited resources leads to increased hostility and decreased collegiality among faculty, contributing to faculty stress, dissatisfaction and potential attrition.

There are several benefits of increased numbers of women faculty within discipline, department, or institution. When more women are present in the hiring process it can lead to increased hiring of additional women (Carrigan, Quinn & Riskin, 2011). More women facilitates greater peer-to-peer faculty mentoring which has been shown to reduce stress and increase satisfaction (Ragins & Scandura, 1994). A greater presence of women faculty also provides greater probability of gender matched student mentoring (Carrigan, Quinn & Riskin, 2011; Ragins & Sandura, 1994; Trower & Chait, 2002). This type of mentoring has been shown to increase student success and for STEM

disciplines the presence of female faculty role models has the potential to attract more women into these faculty positions.

The third area identified by Rosser (2004) was overt discrimination and/or harassment. Gender wage gaps have been shown to persist in STEM fields with recent studies shown men in STEM had a 30% pay advantage over women in STEM jobs (Xu, 2015). Xu further illustrated women in STEM disciplines with children earned less than men in STEM; the presence of dependents increased salary for men. Xu concluded these differences in earnings were ultimately the result of a “professional environment unwilling to acknowledge and support the dual role of women managing a home and career” (2015, p. 513). Both Xu (2015) and Rosser (2004) identify gender discrimination related to the biology of women as issues facing women in STEM disciplines. Walters and McNeely (2010) stated some women in STEM face hostile research environments which include both gender based discrimination and sexual harassment and for these individuals, fear of retaliation inhibits their reporting of these events. They also suggest institutional policies designed to benefit women (e.g., stop the clock tenure policies) often look better on paper as women often report being penalized for utilization of these programs.

Finally, Rosser identified funding issues as the fourth institutional barrier facing women scientists. Studies have found women scientists have less lab space and support than men (Park, 1996) which impacts their overall research productivity. Additionally, in an age of reduced federal funding for research, women are often at a disadvantage in these competitive processes for several reasons. First women are often socialized to be less competitive placing them at a disadvantage in competitive grant processes. Women

also are more likely to work in teams or collaboratively; research styles which are often undervalued and penalized (Rosser, 2004). Finally, low numbers of women in disciplines often results in exclusion from “power circles” where important information is disseminated, including information surrounding funding opportunities (Rosser, 2004; Smith, 2011).

There have been many years of national efforts to increase the participation of women in STEM disciplines. While these efforts have resulted in increases in degree completion, the corresponding increases in faculty numbers has not occurred (Kulis, et al., 2002; Nelson & Rodgers, 2005). Xu (2008b) proposed there were two areas often cited as reasons for the reduced number of women in STEM faculty positions: job preferences and limited opportunities. Women faculty may be choosing jobs they find more satisfying. Xu (2008b) proposed women faculty experience many deficits in their work environment (e.g., they are more likely to be in lower ranks, in non-tenure track positions, have lower salaries, heavier teaching loads, perform more service, and get less support for their research), and structurally related biases within the system of higher education (isolation, marginalization, stereotyping, advancement delays and insufficient support) resulting in reduced job satisfaction making these faculty more likely to leave. Earlier studies supported this theory by showing women faculty found research-oriented jobs to be isolating and competitive, while they derived greater enjoyment out of teaching and prefer more collegial environments (Barbezat, 1991). Park (1996) cited studies illustrating women at teaching institutions were more likely to have a collegial environment which reduced their intent to leave those institutions. She further noted the traditional tenure system of research universities was based in the “masculine ethic of

competition and individualism” (p., 60) which results in a less hospitable environment for women by creating a climate of intellectual and social isolation leading to decreased satisfaction. This may explain why we continue to see women concentrated in non-research intensive institutions (Finkelstein, Conley, & Schuster, 2016). It is hypothesized women, including women in STEM disciplines, may be selecting these non-research intensive institutions because they find those environments less chilly and ultimately more satisfying.

It has not been enough to focus solely on increasing the numbers of women faculty in STEM disciplines, institutions have to be able to keep them in these positions once there. If we want to be able to retain women faculty in these positions, we need to better understand the factors influencing their attrition at twice the rate of men (Callister, 2006; Ceci, et al., 2009; Rosser, 2004; Silander, Haake, & Lindberg, 2013; Trower & Chait, 2002; Walters & McNeely, 2010). It is challenging to study faculty attrition because faculty leave institutions for a variety of reasons and often these reasons are not reported to or recorded by the institution. As a result researchers often study faculty intent to leave (the degree of likelihood an employee will discontinue their participation in the organization (Daly & Dee, 2006)), which has been shown to be a measure of actual leaving behavior (Bluedorn, 1982), rather than measuring actual numbers of faculty leaving an institution.

Theoretical Framework

Many studies of faculty intent to leave, including this one, are grounded in Expectancy Theory (Vroom, 1964). Expectancy theory is a cognitive theory used by researchers to explain the conscious choices individuals make based upon their expectations. Many studies of faculty retention have been based in Expectancy Theory

(e.g., Daly & Dee, 2006; Hagedorn, 1996; Rosser, V., 2004; Smart, 1990; Zhou & Volkwein, 2004). Using the model developed by Vroom (1964), where:

$$M = E \times I \times V$$

(M = an individual's motivation; E = expectancy; I = instrumentality; V = valence)

this section will illustrate how this theory may be applied to the study of faculty retention.

Vroom's equation defines motivation as an individual's desire to stay or leave their position based upon their expectancy (the belief they can do the work and achieve an expected performance), their instrumentality (the belief their performance will lead to a particular outcome), and their valence (desire) for the outcome. Expectancy theory holds that faculty should be motivated to stay in their positions if they feel the effort they put forth will result in the necessary performance to achieve their rewards, and that the rewards for their effort are worth their sacrifices. For example, faculty in tenure-track positions may expect their scholarship to lead to sufficient academic performance necessary to be awarded tenure.

There are several assumptions of this theory to be considered from a faculty viewpoint (Vroom, 1964; Lunenburg, 2011). The first assumption of the theory is people enter an organization or institution with expectations based on their needs, motivations, and past experiences. For faculty this may mean, in part, they select their academic positions based upon what they hope to achieve as a faculty member, the needs they have in their personal and professional life, and their experiences prior to entering an academic position including their graduate student experience and previous faculty positions.

The second assumption of the theory is faculty behavior is based upon conscious choice. This means for faculty, the selection of an institution, or type of position is driven

by the choice they make. In other words, faculty in research-intensive institutions consciously select these institutions for their research environment or focus, while faculty in non-research institutions consciously select these institutions due to their desire for either a balance of teaching and research or greater teaching focus. While some studies indicate women select institutions where they find greater overall satisfaction (Schneider, 2000), this assumption neglects the possibility of discrimination in the hiring process for the institution (conscious or unconscious), or within the institution itself. Both of these are important considerations, but are beyond the scope of this current study.

Third, individuals desire to achieve different outcomes from their work. Some desire to produce as many scholarly works as possible and contribute to their profession through their research. Other faculty desire to pass on their knowledge to the next generation of scholars through their role in the classroom. Many faculty desire to find a balance between their productivity and teaching. Whatever their desire, it must be achievable through their organization. Mismatch between individual and institutional goals will result in decreased motivation. Olsen, Maple, and Stage (1995) examined person situation fit at a research-intensive institution and found differences in faculty perception in departmental support and recognition based on gender and race. They found faculty with higher perceived departmental support had higher job satisfaction.

Finally, individuals will maximize the outcomes of their work for themselves. This assumption is often confounded with the individual's desire to maintain work-life balance. The valence of the outcomes (what the reward is worth) will vary with the individual's life stage (Isaac, Zerbe, and Pitt, 2001). Only when the effort needed to achieve the desired outcomes justifies the required sacrifices in life balance, will the

individual remain highly motivated. This assumption may be more impactful on women faculty than men as women are stereotypically expected to be responsible for household duties and as a result exhibit greater work-life conflict. For example, Becker (1985) proposed gender differences in household responsibilities were related to differences in motivation and work intensity which contributed to occupational segregation by gender. Tack & Patitu (1992) found “life style” stressors (e.g., child care and home responsibilities) had a greater impact on the job satisfaction of women due to the societal expectations placed on women to manage household responsibilities. Perna (2001a) found women faculty were less likely to be married or have children and the effects of parental and marital responsibilities were greater on women than men, indicating women may be impacted by changes in valence due to life-stages and life-stage choices than men.

This work-life conflict has been shown to impact two of the most commonly cited factors influencing faculty intent to leave: faculty stress and job satisfaction.

Overwhelmingly, many studies have illustrated women faculty are more stressed and less satisfied than their male counterparts, often due to factors related to work-life balance (i.e., home responsibilities) or equity (i.e., salary & benefits) and as a consequence are more likely to consider leaving their institution or academia entirely.

Expectancy theory was used to ground this study as it holds faculty should be motivated to stay in their positions if they feel the effort they put forth will result in the necessary performance to achieve their rewards, and that the rewards for their effort are worth their sacrifices. If faculty perceive inequity within the system (i.e., wage gaps, or differences in promotion process) or their valence for the outcome no longer outweighs

their sacrifices (i.e., they fail to maintain work-life balance), then their motivation to stay in their position will decline and they will be more likely to leave their position. In the following section, this chapter will examine faculty intent to leave and two factors predicted to decrease faculty motivation and increase intent to leave.

Retention of Faculty

In higher education studies, retention of faculty is most often examined through a measure of their intent to leave either their institution, or academia entirely. Intent to leave has been shown to be an effective proxy for actual leaving behavior (Bluedorn, 1982; Mobley, 1982; Ryan, Healy, & Sullivan, 2012). In fact, Mobley (1977) described intent to leave as the last step in the employee withdrawal process, and stated it was the result of unmet expectations by the employee. However, O'Meara, Louder, and Campbell (2014) found using intent to leave as a proxy for actual leaving behavior is actually a limitation as they found faculty intending to leave cited different reasons for their intent than did faculty who actually left.

It is rare for faculty to leave a job when they are entirely satisfied (Xu, 2008a, p. 45). Many early studies of intent to leave focused on job satisfaction as the primary predictor of turnover, however, Porter, Steers, Mowday, & Boulian, (1974) found these studies were limiting their view of turnover by focusing solely on satisfaction, and as a result added a measure of organizational commitment to their model. Organizational commitment was defined by these authors and others as the strength of an individual's identification with and involvement in a particular organization. Their study indicated attitudes held by an individual about the organization were better predictors of leaving than attitudes about the work itself. This indicates the structure of the institution itself potentially plays a role in faculty retention. Most studies examining the impact of

satisfaction on intent to leave have found decreased satisfaction increases intent to leave an institution (Daly & Dee, 2006; Gaertner, 2000; Johnsrud & Rosser, 2002; Lee & Mowday, 1987; Rosser, 2004; Rosser & Townsend, 2006; Smart, 1990; Zhou & Volkwein, 2004), or academia entirely (Ryan, Healy, & Sullivan, 2012), but some studies have shown no impact of satisfaction on intent to leave an institution (Ryan, Healy, & Sullivan, 2012).

One of the most cited studies of faculty intent to leave is Smart's causal model of faculty turnover (1990). This model proposed there were three major determinants to faculty turnover: individual characteristics (demographics and work factors), contextual variables (salary, and influence), and external conditions (institutional characteristics). Five faculty and work characteristics (career age, gender, marital status, research time, and teaching time) and two organizational characteristics (organizational decline, and campus governance) were proposed to directly impact intent to leave through three dimensions of job satisfaction (organization, salary, and career satisfaction). After finding a statistically significant relationship between intent to leave and tenure status, Smart analyzed separate models for each group. Both models only explained a small portion of the variance in intent to leave (tenured 13%, non-tenured 14%), and there were significant differences between the groups. Tenured men were more likely to leave as were tenured faculty with higher research time. Tenured faculty with greater teaching time were more likely to leave as an indirect effect through decreased organizational satisfaction. For both tenure groups, younger faculty were more likely to leave, and marital status had no effect on either group. This study found no significant initial effect

of institution type (using Carnegie classification) or discipline (using Biglan's classification) on faculty intent to leave.

While organizational commitment was one additional variable used to examine intent to leave along with satisfaction, researchers have used other measures mediated by satisfaction to measure intent to leave. Johnsrud and Rosser (2002) found the quality of a faculty member's worklife affects their morale and as a result impacts their intent to leave. Other authors have also examine this worklife – satisfaction – intent to leave model for faculty. Like many others examining intent to leave and satisfaction, Rosser (2004) found increasing satisfaction decreased faculty intent to leave, but she also found that while increased positive perceptions of worklife increased satisfaction, it did not have a significant indirect effect on intent to leave; this model explained 20% of the variance in satisfaction and 32% of the variance in intent to leave. Rosser and Townsend (2006) built on this model and examined intent to leave in 968 faculty at 2-year institutions using NSOPF 1999. For these faculty there was no significant impact of gender on worklife, satisfaction, or intent to leave. Overall worklife was shown to have a significant, and indirect effect on intent to leave through job satisfaction. It is significant to note in this sample the respondents were 51.4% female which is common in 2-year institutions. So if women are more satisfied at these institutions then this would help explain the lack of gender differences within this institution type. Conversely, if men at 2-year institutions are less satisfied then the lack of gender differences could also be explained. This higher percentage of women supports studies proposing women are more concentrated at non-research intensive institutions.

In 2004, Zhou & Volkwein, used NSOPF 1999 to build on these earlier models proposing both individual and organizational characteristics along with work environment impacted a faculty member's intent to leave both directly and indirectly through their satisfaction. They also held that external forces such as the job market, research and teaching opportunities, and family circumstances impacted a faculty member's intent to leave. They also ran separate models for tenured and non-tenured faculty and found differences between the two groups. While gender was not significant for tenured faculty, non-tenured women were less satisfied and therefore were more likely to leave. For both groups, increased satisfaction decreased faculty intent to leave. Increased institution size was significant for tenured faculty only, indicating faculty at larger institutions were more satisfied and therefore less likely to leave. Academic discipline was not considered in this study.

While gender differences are central to satisfaction and intent to leave analyses, it has been less common to find studies examining disciplinary differences in faculty intent to leave. Xu (2008a) examined discipline differences in faculty turnover, stating this level of analysis was important as disciplines carry different expectations for their commitment and professional responsibilities. Using hierarchical multiple regression, Xu found a five block model using demographics, human capital measures, workload and productivity measures, perceptions of the work environment, and satisfaction was best at predicting intent to leave for faculty in the hard, pure, non-life (HPN) sciences, and demographic variables had the greatest explanatory power. Overall, the study illustrated disciplinary differences are present in regards to faculty intent to leave.

More recently, Ryan, Healy, and Sullivan (2012) analyzed HERI Faculty Survey data from a single research intensive institution to examine factors related to faculty intent to leave. They examined both faculty considering leaving their institution and faculty considering leaving academia separately. This study also included the construct faculty stress in their analysis. They found faculty in soft, pure disciplines (e.g., art, music, political science), with higher levels of stress, and those who were more productive were more likely to consider leaving their current institution. Faculty in hard, applied disciplines (e.g., medicine, engineering), those with higher levels of family stress, and higher dissatisfaction were more likely to consider leaving academia entirely. It is not too surprising to see increased intent to leave academia in faculty in hard, applied disciplines as these areas are highly employable in the private sector with higher private sector salaries in many cases. Married faculty were less likely to consider leaving academia. They found no significant effects of rank, gender, or ethnicity in their analysis, and indicated faculty stress, satisfaction, institutional characteristics, and discipline were key factors in intent to leave.

Other studies have also examined the effects of faculty stress on their intent to leave. Catano and colleagues (2010) cited the presence of high levels of faculty stress in earlier studies of faculty in the United Kingdom and Australia as the motivating factor for their study of faculty stress in Canadian universities. They found women had higher mean stress scores but the overall effect sizes were small. The greatest gender differences occurred in work-life conflict with women having high levels of stress related to household responsibilities, while men had higher levels of stress related to job satisfaction and organizational commitment. Overall they found women faculty were less

satisfied and therefore had lower job commitment. What was not examined in this study was the relationship between stress and satisfaction and their relationship with job commitment. Barnes and colleagues (1998) found higher levels of faculty stress correlated with greater intent to leave. In this study, stress due to time commitments had the greatest effect on intent to leave, and non-tenured men were more likely to leave than non-tenured women.

The effect of faculty stress has been shown to be mediated through job satisfaction. Hagedorn & Sax (2003) classified faculty stressors as “pull factors” (i.e., pulled individuals away from their work) and found women faculty had higher levels of job-related, home-related, financial, and elder care stress than men. They concluded the strongest predictor of job satisfaction was low level of job related stress, and overall, women faculty exhibited higher levels of stress and as a result were less satisfied than their male counterparts. What was not examined in this study was how stress and satisfaction contributed to faculty intent to leave. In another study, Hagedorn (2000) did not include stress in their model examining job satisfaction but rather stated “[stress is] perceived as an all-inclusive term that overlaps with all aspects of the job” (p. 9), and she felt stress was a negative consequence due to the individual’s response to the mediators and triggers involved with satisfaction. The continued pervasiveness of stress in faculty careers warrants further examination of the relationship between stress and satisfaction and their impact on faculty intent to leave.

Overall, the effect of gender on intent to leave has had mixed results. While Ryan, Healy, and Sullivan (2012) found no effect of gender on intent to leave, Blix, Cruise, Mitchell, and Blix (1994) found women were more likely to consider changing jobs than

men. Their study however did have a very low percentage of women, was a single state-wide university system analysis, and therefore may not be readily generalizable to other institutions. More recent studies illustrated gendered differences in leaving an institutions and showed men leave faculty positions for better salary and advancement opportunities, while women more often cite personal reasons for leaving (Gardner, 2013). Johnsrud & Heck (1994) found women faculty were more likely to leave while Barnes and colleagues (1998) found men were more likely to leave.

Studies of faculty intent to leave consistently find job satisfaction mediates an individual's intent to leave. While some researchers have examined the indirect effects of worklife on intent, others have used stress as an indicator of faculty intent to leave. Gender differences in intent to leave have varied in this area of research with some studies finding women more likely to leave, others finding men more likely to leave, and some finding no effect of gender on intent to leave. No study has explicitly examined faculty group differences in intent to leave based upon gender discipline, and institution type. Previous studies have not examined these differences between research intensive and non-research intensive institutions, and when discipline has been included its effects were either insignificant or mixed.

Faculty Stress

Stress has often been examined in faculty studies related to faculty intent to leave (Barnes, et al, 1998; Johnsrud & Rosser, 2002; Ryan, Healy, & Sullivan, 2012; Smart, 1990) as well as in studies of faculty job satisfaction (Catano et al., 2010; Gates, 2000; Hagedorn, 1996; Hagedorn & Sax, 2003; Olsen, 1993; Tack & Patitu, 1992; Winefield & Jarrett, 2001). In fact Daly & Dee (2006) found the presence of workplace stressors had

a negative impact on job satisfaction which had been shown by others (Johnsrud & Rosser, 2002, Rosser, 2004) to lead to increased intent to leave.

While academia was once believed to be a “low stress” work environment, since the 1980s, stress levels have been shown to be increasing. This increased stress has then been linked to the retention and attrition of academic faculty (Gmelch & Wilke, 1991; Gmelch, et al., 1994; Catano, et al., 2010, Gillespie, et al., 2001; Ryan, Healy, & Sullivan, 2012; Olsen, 1993; Winefield & Jarrett 2001). Stress has been shown to be a major factor in over half of all faculty considering leaving their current institution and in one-third of faculty who were considering leaving academia altogether (Gmelch & Wilke, 1991).

Conceptualizing Faculty Stress. Gmelch (1982, p. 84) defined stress as “the anticipation of one’s ability to respond adequately to a perceived demand, accompanied by the one’s anticipation of negative consequences” if they are unable to respond to the demand. This definition is derived from Gmelch’s Stress Cycle Theory as a means to explain the process of stress (Gmelch & Wilke, 1991). The first stage in the stress cycle is the presence of a demand on the individual which then results the individual’s perception of the demand being generated (stage two). In stage three, the individual responds to the demand in psychological, physiological, and/or behavioral responses. The consequence of these responses characterizes the final stage of the model and includes the long-range effects of the response.

In academia, the role of a faculty member is complex. Faculty are asked to perform multiple roles as teacher, researcher, advisor, university citizen, and departmental colleague, and as such, have attention and time demanded of them from

students, other faculty, institutional administrators, in addition to their personal life. These demands from multiple sources become sources of stress. There have been many specific sources of stress coming from these demands identified in the literature, including: administrative bureaucracy and red tape (Koester & Clark, 1980), high levels of self-expectation (Gmelch et al., 1986; Gmelch & Wilke, 1991), self-imposed pressures for achievement (Gmelch, et al., 1984), inadequate recognition (Gillespie, et al., 2001), insufficient salary (Koester & Clark, 1980; Gmelch & Wilke, 1991; Gillespie, et al., 2001; Catano, et al., 2010), job insecurity (Catano, et al., 2010; Dua, 1994; Gillespie, et al., 2001), work overload (Catano, et al., 2010; Koester & Clark, 1980; Gillespie, et al., 2001; Gmelch & Wilke, 1991), student interactions (Gillespie, et al., 2001), inadequate career development plans, and lack of well-defined promotion policies (Barnes et al., 1998; Catano, et al., 2010; Gillespie, et al., 2001), and insufficient resources (Koester & Clark, 1980; Gillespie, et al., 2001; Gmelch & Wilke, 1991). Organizational culture can also contribute to faculty stress through poor working conditions, role conflicts and ambiguities, lack of collegiality (Seldin, 1987), inequality (Boyd & Wylie, 1994), party politics, and lack of participation in decision making (Barnes, et al., 1998).

There are many consequences of these work place stressors on faculty. High levels of stress in the workplace are associated with decreased job satisfaction, work productivity, and organizational commitment, as well as negative impacts on physical and mental health (Gates, 2000). Faculty stress has been associated with an increased intent to leave an institution or an academic career (Barnes, et al., 1998; Blix, et al., 1994; Gillespie, et al., 2001; Johnsrud & Rosser, 2002; Rosser, 2004; Ryan, et al., 2012).

Examining Faculty differences in Stress. In 1994, Eric Dey examined differences in the perception of stress by different faculty groups. His argument was previous studies failed to address faculty group differences in stress and this lack of understanding of group differences would hinder academic and institutional policy development as the professoriate became more diverse. Because of this, Dey grouped faculty based upon tenure status, race, and gender in order to examine their differences in stress perception.

Using the first iteration of the HERI Faculty Survey in 1989 – 1990, which included 18 items measuring faculty stress, Dey found significant differences in the perception of stress across the faculty groups based upon tenure status, race and gender. The most common sources of stress for faculty in this survey were time pressures and lack of personal time. Patterns of faculty stress perception varied over the survey items. Dey used EFA to further examine the dimensions of faculty stress and reported stress could be divided into four factors: Time Constraints, Home Responsibilities, Governance Activities, and Promotion Concerns. Using CFA models performed on each faculty group, the study then compared this factor model across race and gender (tenure was removed to conserve sample size) and found significant differences in how the faculty groups perceived stress across the four factors.

Two decades later much has changed, both in higher education and within the HERI Faculty Survey. The highest reported stress item in the 1989 -1990 sample, time pressures, is no longer included in the 2013 – 2014 HERI Faculty Survey. Additionally, the four lowest reported stress items in the 1989 – 1990 sample (fundraising expectations, children’s problems, marital friction, and long distance commute), and one additional

item (care of elderly parent) are no longer included in the HERI Faculty Survey, making a total of six items no longer measured. The 2031-2014 HERI Faculty survey also added seven additional items to the stress survey (self-imposed high expectations, change in work responsibilities, institutional budget cuts, institutional procedures and “red tape”, personal finances, working with underprepared students, and job security). These changes in the survey items reflect changes in the faculty role and institutions since the 1990s.

Ryan, Healy, and Sullivan more recently (2012) performed factor analysis on HERI Faculty Survey data from a small sample of faculty ($n = 587$) at a single research intensive institution in 2005 and found a three factor solution for stress using principal components analysis with a varimax rotation. The three factors were named Family, Publishing, and Work. There were some similarities in these more recent factors to Dey’s earlier factors; Family was similar to Household Responsibilities, Publishing was similar to Promotion Concerns, and Work was most like a combination of Time Constraints and Governance Activities. Ryan, Healy, & Sullivan (2012) found, using binary logistic regression techniques, a one unit increase in stress resulted in increased intent to leave their institution for another academic position and academia entirely.

Dey indicated in his study the faculty groups selected for his analysis were not the only way differences in the perception of faculty stress could be viewed. He stated faculty groups could be based upon additional individual and/or organizational characteristics. Therefore his methodology provided an appropriate starting point to look at factors influencing the retention of women in STEM.

From Dey’s work (1994) and others, it is clear women faculty are more stressed than men (Blix, Cruise, Mitchell, and Blix, 1994; Hagedorn & Sax, 2003; Catano, et al.,

2010; Johnsrud & Rosser, 2002). Ultimately, Dey found tenured women were more likely to be stressed by teaching load, research load, productivity, and the review/promotion process compared to men. Additionally women were more likely, and tenured women twice as likely, to exhibit stress due to management of household responsibilities. Using the Person-Environment Fit model, Blix, Cruise, Mitchell, and Blix (1994) examined faculty stress among tenure track faculty within a large state-wide university system and found women had higher mean stress scores compared to men. Catano, and colleagues (2010) examined faculty stress in Canadian universities in response to studies out of the UK and Australia citing high levels of faculty stress reported. They found women had higher mean stress scores than men. The greatest difference in stress between men and women was in work-life conflict where women were even more stressed than men. Work-life stress is often found to be more prevalent in women due to the increase likelihood of their role as primary caregiver in the home, and frequently bearing a greater portion household responsibilities. The effect sizes for gender differences in this study were small ($< .02$).

While most studies of faculty stress have examined gender differences, fewer studies have looked at differences in stress due to faculty discipline. Gmelch and colleagues (1986) used Biglan's (1973) disciplinary classifications (hard/soft sciences, pure/applied orientations, life/non-life subject matter) to examine disciplinary differences. They found soft, pure, non-life (SPN) faculty (e.g. English & history) were more stressed with rewards & recognition than hard, pure, non-life (HPN) (e.g., chemistry & mathematics), hard, applied, life (HAL) (e.g., agriculture & veterinary medicine), and soft, applied, non-life (SAN) (e.g., accounting & economics) faculty. This

is not surprising because SPN disciplines are often the lowest paying positions (Perna, 2001b). Hard, pure, life (HPL) (e.g., botany & entomology) and HAL faculty were less stressed with student interactions than hard, applied, non-life (HAN) (e.g., engineering & computer sciences), soft, pure, life (SPL) (e.g., political science & sociology), SAN, and soft, applied, life (SAL) (e.g., education) faculty. What is lacking from this study are disciplinary differences in faculty stress as a result of factors outside of the work environment.

Most studies of faculty stress have focused on research-intensive institutions (e.g., Barnes, et al., 1998; Gillespie, et al., 2001; Gmelch & Wilkes, 1991; Gmelch, et al., 1986, Ryan, Healy, & Sullivan, 2012). These studies often find faculty are most commonly stressed due to conflicts in time allocation (time spent in research, teaching, and service) within their work environment. While Gmelch and colleagues used time allocation/constraints in their model, their definition of the variable did not include items related to teaching research and service but rather focused on items impacting general duties such as paperwork, meetings, and interruptions (1986). Considering the differences seen in time allocation to and emphasis in research, teaching, and service found between different institution types, corresponding differences in stress should be seen. For example, Astin, Korn, & Dey (1991) found university faculty to have increased stress due to productivity and fundraising demands, while college and 2-year institution faculty identified teaching load as their greatest stress.

Although all faculty experience stress to some degree, and some stress is considered beneficial, high levels of faculty stress are likely to increase a faculty member's intent to leave. Dey's 1994 model provides a foundational starting point to look

at additional faculty group differences in perceptions of stress. Gender, discipline, and institution type all have the potential to impact faculty stress, but have not been examined when looking at differences in faculty perceptions of stress. Therefore RQ 1 asks if these three faculty characteristics (gender, discipline, and institution type) result in differences in faculty perception of stress.

Job Satisfaction

Job satisfaction is one of the most studied components of organizations.

Historically, much like faculty stress, the construct of job satisfaction for faculty in higher education was an under-examined topic in job satisfaction research (Sabharwal & Corley, 2009) because it was believed academia was a highly satisfying work environment. Faculty job satisfaction continues to be an important construct for analysis by higher education administrators due to the changing demographics of higher education faculty members including: increasing numbers of women, under-represented minority, first generation college students, disabled, and foreign-born faculty. Additionally, job satisfaction is almost always used as an intervening variable in the examination of faculty intent to leave.

The study of job satisfaction is often rooted in Herzberg's Two Factor Theory of Job Satisfaction (Herzberg, Mausner, Peterson, & Capwell, 1957; Herzberg, Mausner, & Snyderman, 1959). Herzberg held there were two factors influencing an individual's motivation to work: motivators and hygienes. Motivators are conditions creating motivation in the individual to work, or factors increasing job satisfaction. These factors included achievement, recognition, the possibility for job growth, the possibility for career advancement, the individual's level of responsibility, and the job itself. Hygienes are defined as factors extrinsic to the job itself leading to dissatisfaction. Hygienes

included organizational policy and administration, supervision, interpersonal relations, salary, status, job security, personal life, and working conditions. In their 1959 analysis however, only 6 of these 14 motivators and hygienes were found to be influential on job satisfaction: achievement, recognition, the work itself, responsibility, the possibility for career advancement, and salary.

More recent models of job satisfaction have built upon these earlier models. Hagedorn's (2000) model expressed job satisfaction as a continuum from low satisfaction, resulting in disengagement from the job, to an intermediate level of satisfaction resulting in acceptance or tolerance of the job, to high satisfaction, resulting in appreciation of job and active engagement. In her model the factors influencing job satisfaction are then classified into two categories: mediators and triggers.

Mediators were defined as factors that influence or moderate the relationships between the variables (Hagedorn, 2000). Hagedorn subdivided mediators into three categories: motivators & hygienes, demographics, and environmental conditions. Hagedorn's motivators & hygienes were based upon Herzberg's earlier Two-Factor theory (1959) where motivators are variables leading to increases in satisfaction and hygienes are variables leading to increased dissatisfaction. Demographic variables were identified as variables that are stable and remain fixed throughout a faculty career yet impact job satisfaction. These include gender, race/ethnicity, institution type, and academic discipline and are common to most studies satisfaction, as well as intent to leave (e.g., Hagedorn, 1996; Hagedorn & Sax, 1999; Olsen, Maple, & Stage, 1995; Smart, 1990). Environmental conditions influencing job satisfaction consist of the social and working relationships between a faculty member and their peers, their administrators,

and their students. Triggers were defined as significant life events either related or unrelated to the job. Hagedorn identified six triggers in this model including changes in life stage, family-related or personal circumstances, rank and tenure, perceived justice, mood/emotional state, or transfer to a new institution. Hagedorn, in preliminary analysis of her model, found the highest predictive mediators were the work itself, salary, relationships with administration, student quality and relationships, and institutional climate and culture. She also showed job satisfaction increased with age, was higher in married faculty than divorced, and changes in rank or institution resulted in a decrease in satisfaction.

Hagedorn and Sax (2003) used the HERI Faculty Survey to examine factors related to faculty job satisfaction including stress. They found men were more satisfied than women, and while men had higher levels of marital stress, women had higher levels of job-related, home-related, care-related, and financial stress. The strongest predictor of faculty job satisfaction in this analysis was a low level of job related stress. While the authors did not examine faculty intent to leave, they suggested women would be more likely to interrupt their career due to their higher levels of stress and lower levels of satisfaction.

Faculty outside the historical norm (women, faculty of color, disabled, and first generation college students) have all been shown to be less satisfied than faculty who fit the historical norm of higher education (white, male, able-bodied, and from higher social classes) (Seifert & Umbach 2008). It has been well established that women faculty are less satisfied than men (e.g., August & Waltman, 2004; Bilimoria et al., 2006; Blackburn & Lawrence, 1995; Bozeman & Gaughan, 2011; Cano & Castillo, 2004; Hagedorn, 1996,

2000; Hagedorn & Sax, 2003; Olsen & Near, 1984; Olsen, et al, 1995; Rosser, 2004; Sabharwal & Corley, 2009; Seifert & Umbach 2008, Settles, et al., 2006; Tack & Patitu, 1992). However, there have been fewer studies that have shown no sex differences (Olsen & Near, 1994; Ward & Sloane, 2000), and occasionally, studies have shown in some domains of satisfaction, women score higher than men (Sabharwal & Corley, 2009).

The proposed use of the same methodology Dey (1994) used to examine faculty stress to examine faculty group differences in job satisfaction different faculty groups would allow for better understanding of faculty group differences enabling academic administrators to develop policies and implement strategies targeted to these groups. The most commonly targeted faculty group examined in the literature is tenured versus non-tenured faculty. While there are an infinite number of faculty group combinations examinable, in order to target policies and strategies for the retention of women in STEM disciplines, gender, discipline, and institution type were selected as the focus of this study.

Job satisfaction has been shown to be important factor in predicting the retention of a faculty member (Carrigan, Quinn, & Riskin, 2011; Hagedorn, 1996; Rosser, 2004; Seifert & Umbach, 2008; Smart 1990). Many of these studies have established women faculty are less satisfied than men (August & Waltman, 2004; Bozeman & Gaughan, 2011; Blackburn & Lawrence, 1995; Hagedorn, 1996; Olsen, Maple, & Stage, 1995; Seifert & Umbach, 2008; Trower & Chait, 2002). The presence of dissatisfied women faculty has the potential to impact the career mentoring performed by these faculty with students, and therefore faculty with low job satisfaction and/or job commitment may be

less likely to encourage students to pursue academic careers. Therefore, the examination of factors influencing job satisfaction and its effect of faculty intent to leave, will provide administrators and policy makers the information necessary to address the continuing lag of women faculty in STEM positions. In theory, if women faculty in STEM disciplines are less satisfied in their job they will be less likely to encourage women students to pursue academic careers, but if women are satisfied in their job then there should be increased recruitment of women into the discipline through increased gender matched mentoring (Ragins & Scandura, 1994). The STEM pipeline, beginning from selection of college major to pursuit of terminal degree, often focuses on the proximal end of the pipeline (the selection and completion of STEM majors) and not the distal end (recruitment and retention of faculty). Retention of satisfied women faculty has the potential of positively feeding back on the pipeline through the recruitment of new students into the discipline, whereas unsatisfied women faculty may negatively feedback resulting in recruitment of fewer women faculty in the future.

Job satisfaction is a commonly studied component in examination of faculty intent to leave. Use of Dey's model to examine differences in faculty perceptions of job satisfaction will allow us to better understand why we fail to retain certain faculty, especially women in STEM and is the focus of research question 2 in this study. The use of job satisfaction as a mediator between faculty stress and intent to leave will help us better understand faculty group differences in the factors contributing to faculty attrition (RQ 4) and hopefully allow institutions to be better able to create policies and procedures, and develop an institutional culture better able to retain women in faculty positions especially in STEM disciplines.

Summary

Women continue to be underrepresented in STEM faculty positions and leave these positions at twice the rate of men (Callister, 2006; Ceci, et al., 2009; Silander, Haake, & Lindberg, 2013; Trower & Chait, 2002; Walters & McNeely, 2010). Previous research has shown women are more stressed, less satisfied, and more likely to leave their institution or academia entirely. Women have also been shown to be aggregated in non-research intensive positions. In order to better understand why institutions lose women faculty in STEM at a higher rate than men, and why women are more likely to be in non-research intensive STEM institutions, a better understanding of the factors influencing the retention of women, including faculty differences in stress and job satisfaction is needed. Chapter three will outline the methodology used to make this examination.

CHAPTER III

METHODOLOGY

Understanding factors that influence faculty intent to leave is an important component in the recruitment and retention of diverse, qualified faculty. In STEM disciplines, the recruitment and retention of women faculty is vital in order to develop future generations of women faculty (Callister 2006; Diekman, et al., 2015; Kaminski & Geisler, 2012; NAS, 2007; Walters & McNeely, 2010; Xu, 2008b), and to develop a globally competitive STEM workforce (Rosser, 2004). While most previous research (Bilimoria, et al., 2006; Bozeman & Gaughan, 2001; Carrigan, et al., 2011; Castillo & Cano, 2004; Daly & Dee, 2006; Darrah, Hougland, & Price, 2014; Kaminski & Geisler, 2012; Olsen, et al., 1995; Russell, 2010) examining gender differences in faculty stress, job satisfaction, and faculty turnover have focused on research-intensive institutions, the purpose of this study is to examine differences in these constructs between faculty groups based upon gender, discipline, and institution type, expanding beyond research-intensive institutions in order to compare these institutions to non-research intensive institutions. The rationale for this analysis is based on previous research illustrating the presence of gender differences in faculty stress, job satisfaction, and intent to leave combined with the continued concentration of women in STEM disciplines at non-research intensive institutions (Hagedorn, 1996, Olsen, et al., 1995, Sabahwal & Corley, 2009, Schneider,

2000; Trower & Chait, 2002). It is unknown why women faculty are more concentrated in non-research intensive institutions, although studies have indicated several possibilities. Studies have shown non-academic factors such as resources, collegiality, institutional climate, and personal life decisions impact faculty stress, satisfaction, and intent to leave academia. Academically, women faculty have been shown to gain greater satisfaction from teaching than men (Barbezat, 1991) and non-research intensive institutions have a greater emphasis on teaching possibly resulting in the self-selection of women for this type of institution (Umbach, 2008). If women are self-selecting into non-research intensive institutions due to their preference for teaching oriented positions or for other non-academic reasons, then we would expect to see greater satisfaction and less intent to leave from women in those institutions. To expand on our existing knowledge of factors influencing the retention of women faculty in STEM disciplines in higher education the following research questions were proposed:

Research Question 1. Do faculty differ in their perceptions of stress based upon their discipline, gender, and institution type?

Research Question 2. Do faculty differ in their perceptions of job satisfaction depending upon their discipline, gender, and institution type?

Research Question 3. Do faculty differ in their intent to leave academia depending upon their discipline, gender, and institution type?

Research Question 4. Are there structural differences in the relationship between stress, job satisfaction, and intent to leave based upon faculty gender, discipline, or institution type?

Methodology

The goal of this analysis is to expand understanding of the factors related to women faculty, especially those in STEM disciplines, being less satisfied, more stressed, and more likely to leave academia than men. To address to this question, I used a quantitative, correlational design to examine the relationship between faculty stress, job satisfaction, and their impacts on intent to leave in faculty groups based upon discipline (STEM and non-STEM), gender (men and women), and institution type (research and non-research institutions) as expressed in Figure 5. The study used an existing secondary data set, HERI 2013 Faculty Survey, to examine these relationships.

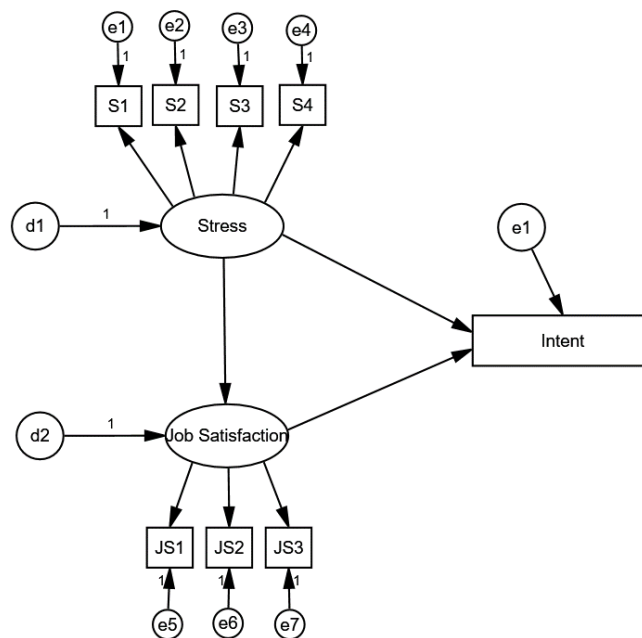


Figure 5. Path model of the proposed relationship between stress, job satisfaction, and intent to leave. Stress was measured by 19 indicators and four factors, Satisfaction was measured by 20 indicators and 2-3 factors, and intent to leave was measured by six

indicators. Stress is predicted to have both direct and indirect effects on faculty intent to leave.

The study was designed in two parts. The first examined each construct individually to explore faculty differences in the perception of each construct based upon faculty group. Research questions 1-3 were addressed by first using exploratory factor analysis to reduce the dimensions of each construct prior to performing MIMIC (multiple indicator, multiple cases; Kline, 2011) analysis to examine group differences. MIMIC is a special case of SEM in this analysis used to examine group differences on the latent mean. MIMIC is an alternative method for comparing factor invariance using multi-sample confirmatory factor analysis (CFA) in which the compared groups are classified using dummy variables. Specifically, MIMIC modeling is essentially a CFA with the inclusion of covariates to account for potential differences on the latent mean (e.g., stress, job satisfaction, or intent) (Brown, 2014). In this analysis, the covariates are used to examine group differences on the latent mean. This method of modeling, compared to a multiple groups CFA, is an alternative method used when comparing more than two groups, is less restrictive in sample size requirements, and is more parsimonious due to fewer freely estimated parameters. One potential drawback to this method is it only allows for the examination of invariance in indicator intercepts and factor means whereas other methods, such as a multi-group CFA, allow for the comparison of measurement and structural parameters. (Brown, 2014).

The second part of this study then used each of the individual MIMIC models for each construct to develop a structural equation model (SEM) to examine the direct and indirect relationships between stress, job satisfaction, and intent to leave (RQ 4). This model is a hybrid SEM model composed of three measurement models and the

corresponding paths between the constructs. SEM techniques enable researchers to examine the structural relationship between latent constructs (faculty stress, job satisfaction, and intent to leave) and their measurement models (the relationship between the construct and the indicators) (Tomakren & Waller, 2005). This technique allows for the simultaneous analysis of a large number of linear relationships examining direct and indirect relationships between the constructs. In this analysis, SEM techniques allow for the simultaneous examination of the measurement models for each construct and their direct and indirect relationships. SEM has advantageous over MR in it is able to perform all estimates in a single step (as opposed to multiple models in MR), accounts for measurement error, and allows for testing of model fit. It also allows for the statistical analysis of latent constructs rather than observed variables. Additionally, SEM allows for the simultaneous analysis of a large number of linear equations (Tomarken & Waller, 2005), something not available in traditional multiple regression techniques.

Data Source

Data for this study came from the 2013 HERI Faculty Survey administered during the 2013–2014 academic year. The purpose of the survey is to assess the experiences of higher education faculty. The Cooperative Institutional Research Program (CIRP) at the Higher Education Research Institute (HERI) has administered this survey triennially, ten times since 1989. The HERI 2013 faculty survey is the most comprehensive faculty survey administered in the United States since the administration of the National Survey of Postsecondary Faculty (NSOPF) 2004 in 2003. Unfortunately, funding for NSOPF did not continue beyond the 2004 sample, and the HERI faculty survey provides more recent data representing faculty experiences in the United States. It is important to note the cross sectional survey design of the HERI Faculty Survey does not allow for causal inferences

and the results may not be generalizable for all faculty. Some faculty groups (e.g., part-time faculty, faculty at 2- year institutions, graduate faculty, or for-profit institutions; see sample selection) were not examined in this analysis and therefore the results may not be applicable for those groups

To better approximate its sample representation, CIRP stratified and weighted the HERI Faculty survey sample data to a normative population (Hurtado, Eagan, Pryor, Whang, & Tran, 2012). This weighting and stratification process is important as it serves to correct for response bias occurring due to changes in the sample increasing the reliability of the sample data (CIRP, 2017). The normative sample generated was based on full time undergraduate faculty at baccalaureate granting or higher colleges and universities admitting a minimum of 25 first time full time students, a total 1,553 institutions. To stratify the sample, twenty stratification groups were formed base upon institution type (4-year, university), control (public, private, nonsectarian, Roman Catholic, other religious), and selectivity (median SAT verbal and math scores or composite ACT scores for first year students). CIRP then used IPEDS data to compute full time male and female faculty population by rank for these groups. Only institutions where all full time undergraduate faculty (FTUG) were surveyed and for 4-year institutions a minimum of 35% of faculty responded and universities a minimum of 20% were included in the normative sample. FTUG faculty were defined in this sample as faculty who responded in some combination to their employee status (question 2), their teaching role (question 11), and number of hours currently teaching (question 22). A total of 22,422 surveys were returned but only 16,112 were included in the normative sample. The largest group excluded from the sample were those where the institution did

not meet the return rate threshold ($n = 7,931$). The final sample included 7,514 women, and 8,598 men.

After stratification of the sample, CIRP used a three-stage weighting process to generate the normative data set. The first stage created a within-institution, or response-bias, weight by sorting FTUG into eight categories by gender (male/female) and rank (professor/associate professor/assistant professor/other). The first weight was equal to the ratio of the total number of faculty in the institution and the number of respondents in each category. The goal of this weight was to eliminate response bias by gender or rank and adjust the total number of respondents to the institution total. If ranks for the institution were unknown then the institution was weighted by gender alone.

The second stage of weighting used the established stratification to generate corrected between-stratification cell differences by sorting institutions into their stratification cells and faculty within the cell into their gender-rank category. The second weight was then calculated as the ratio of the total FTUG counts from IPEDS and the weighted sum of the norms sample FTUG respondents. This was known as the institution type-selectivity weight.

The third weight applied was a post-stratification weight determined to be necessary due to the need to correct for under sampling of new faculty hires. CIRP first calculated the distribution of FTUG faculty from the 1989 and 2004 surveys based upon 432 possible combinations of variables including year of appointment, institution type and control, rank, and gender (Hurtado, et al., 2012). They then calculated the same distribution from the weighted current norms samples and the ratio of the two distributions comprised the third weight. This three-stage weighting along with the

stratification serves to increase the reliability of the survey items by correcting for response bias.

Sample Selection Criteria

The HERI 2013 faculty survey data is composed of 7,514 women and 8,598 men from 269 four-year colleges and universities (Hurtado et al., 2012). The sample selected for this analysis was restricted to full time, undergraduate, instructional faculty at all public and private, 4-year, non-profit colleges and universities. Faculty teaching solely in graduate programs were not included in the HERI sample set and therefore were not included in this analysis.

The exclusion of part time faculty, faculty at 2-year and for-profit institutions was an attempt to simplify an already complex model. While part time faculty were included in the HERI 2013 sample, they were not included in this analysis due to the disproportionate number of women found in part-time positions (Nettles, et al., 2000; Toutkoushian, 1999; Toutkoushin & Bellas, 2003). Part-time faculty are also less likely to advise and mentor students, thus have a smaller impact on the STEM feedback model (Umbach, 2008).

In order to examine structural differences between research-intensive and non-research intensive institutions, the omission of for profit institutions is intentional due to fundamental structural differences in these institutions. Non-profit and for-profit higher education institutions have structural differences in their control, operation, and mission (Bennett, Lucchesi, & Vedder, 2010). While non-profit institutions center their missions on the creation of service of the public good, for-profit institutions have missions based upon profit maximization while providing a service to students. These differences may confound the structural comparisons desired in this study.

Two- year institutions were also excluded from this analysis on the basis women faculty have been shown to often be disproportionately represented in 2-year institutions (Clery, 2013; Cress & Hart, 2009; Perna, 2003; Smith, 2012; Tack & Patitu, 1992). Faculty at these institutions were not included for several reasons. First, 2-year intuitions are structurally different from 4-year institutions. The amount of STEM education performed at 2-year institutions is often significantly less, more technical in nature, and fewer STEM disciplines are represented. It would be inappropriate to aggregate 2-year faculty in with non-research intensive institution faculty due to these differences. In asking the question of how we retain women in STEM disciplines in order to foster the next generation of faculty, part time faculty, faculty at 2-year and for-profit institutions would likely have the least impact on this process. Future studies would needed to examine the impacts of stress, satisfaction, and intent to leave for these faculty groups.

Instrumentation

The primary independent variables in this analysis were faculty stress, job satisfaction, and intent to leave (institution or academia). The HERI 2013 faculty survey included sets of items used to operationalize faculty stress, job satisfaction, and intent to leave. The analysis of these constructs was necessary in order to then examine the relationship between the constructs themselves (Figure 5), the differences between faculty groups based upon gender, discipline, and institution type.

HERI 2013 faculty survey included 19 questions related to faculty stress (Table 2). These questions asked faculty members to identify the extent of the source of stress during the previous two years on a 4-point scale where 1=*Not applicable*, 2=*Not at all*, 3=*Somewhat*, and 4=*Extensive*.

Table 2 Sources of stress identified in HERI 2013 Faculty Survey in the question “Please indicate the extent to which each of the following has been a source of stress for you during the past two years.”

Item
Managing household responsibilities
Childcare
My physical health
Review/promotion process
Subtle discrimination including prejudice, racism, and sexism
Personal finances
Committee work
Faculty meetings
Colleagues
Students
Research/publishing demands
Institutional procedures/ red tape
Teaching load
Lack of personal time
Job security
Working with underprepared students
Self-imposed high expectations
Change in work responsibility
Institutional budget

Even though previous studies, using earlier iterations of the HERI Faculty survey, have found stress to be operationalized into four factors (Dey, 1994), there is evidence re-examination of the factor structure for stress was warranted in this analysis. The four factors identified by Dey were identified as Time Constraints (lack of personal time, time pressure, and teaching load), Home Responsibilities (household responsibilities, childcare, children’s problems, and marital friction), Governance Activities (faculty meetings, committee work, and colleagues), and Promotion Concerns (colleagues, review/promotion process, research/publishing demands, and subtle discrimination). One item, colleagues, cross loaded onto two factors, Governance Activities and Promotion Concerns. While most sources recommend deleting items cross-listing on two factors, Dey elected to retain the item. Dey did not provide data for score reliability in his

analysis, while the four factor solution had a NFI (Normed Fit Index) of .990 for the full sample indicating adequate model fit.

The HERI 2013 Faculty Survey questions related to stress have evolved since Dey developed these factors using HERI 1989-1990 data set. A total of six faculty stress items are no longer included in the stress scale including one item included in Dey's model of faculty stress (time pressure) (1994). Seven additional measures of faculty stress have been added to the HERI 2013 Faculty Survey. These added measures included: personal finances, institutional procedures/red tape, job security, working with underprepared students, self-imposed high expectations, change in work responsibility, and institutional budget. The lack of reliability estimates, limited range of validity measures, and the evolution of the survey supported the need to perform an EFA prior to MIMIC to verify the continuation of the four-factor solution for the construct of stress and to determine the effect of the nine new measures on the previously identified factor structure.

Job satisfaction was measured using 20 questions included in the HERI 2013 faculty survey (Table 3). Prior to this analysis a confirmed factor structure for satisfaction using the HERI survey had not been identified. As a result an EFA was performed on the 20 survey items to establish a preliminary factor structure. The job satisfaction questions asked the faculty respondents to identify on a five-point Likert scale where 1 = *Not applicable*, 2 = *Not satisfied*, 3 = *Marginally satisfied*, 4 = *Satisfied*, and 5 = *Very satisfied*, their level of satisfaction for each question. While the HERI 2013 Faculty Survey data set included two constructs for job satisfaction, these constructs were developed using item response theory (IRT) as opposed to classical test theory (CTT). While there are significant advantages to IRT over CTT, including the capability of better

detecting parameters with differential functioning, IRT has its limitations. Specifically IRT methods lack covariances which are often of interest in multi-group comparisons (Kline, 2011). The two IRT generated constructs in HERI relevant to this study include Workplace Satisfaction, and Salary Satisfaction. The Workplace Satisfaction construct was defined by HERI as “a unified measure of the extent to which faculty are satisfied with their working environment” and is composed of five items, satisfaction with autonomy and independence, professional relationships with other faculty, competency of colleagues, departmental leadership, and course assignments (Hurtado, et al., 2012). Salary satisfaction was defined as “a unified measure of the extent to which faculty are satisfied with their compensation packages” and includes six items: satisfaction with salary, retirement benefits, opportunity for scholarly pursuits, teaching load, job security, and prospects for career advancement (Hurtado, et al., 2012). These two constructs, of which include eleven of the 20 satisfaction survey items, were used to establish a preliminary, proposed, two factor structure for job satisfaction, and EFA will be performed on the measures of job satisfaction to identify the validity of these constructs using CTT and determine whether or not a two factor structure of job satisfaction is warranted in the subsequent analyses.

Table 3 Job Satisfaction items from the HERI 2013 Faculty Survey

Item Description
Salary
Health benefits
Retirement benefits
Opportunity for scholarly pursuits
Teaching load
Quality of students
Office/lab space
Autonomy and independence
Professional relationships with other faculty
Competency of colleagues
Job security
Departmental leadership
Course assignments
Freedom to determine course content
Availability of child care at this institution
Prospects for career advancement
Clerical/administrative support
Overall job satisfaction
Relative equity of salary and job benefits
Flexibility in relation to family members or emergencies.

Intent to leave was measured in the HERI Faculty Survey by 4 items (Table 4).

Two of these items inquired about activities related to intent to leave for the faculty member in the past two years and each item was measured on a 2-point, *yes/no* scale. The remaining two questions asked the faculty member if they could begin their career again would they return to their current institution, and would they still have entered a faculty position. These responses were measured on a five-point Likert scale where 1 = *Definitely no*, 2 = *Probably no*, 3 = *Not sure*, 4 = *Probably yes*, and 5 = *Definitely yes*. There is a lack of information on the reliability and validity of the items measured. For the purposes of this study, factor analytic procedures will be used to inspect the theoretical structure of the instrument, whereas Cronbach's alpha will be used as a

measure of internal consistency reliability. In this analysis an EFA was performed to explore possible factor structures for this construct.

Table 4 HERI 2013 Faculty Survey items for Faculty intent to leave

Item Description
<i>During the past two years have you?</i>
Considered leaving academe for another job?
Considered leaving this institution for another?
<i>If you were to begin your career again, would you:</i>
Still want to come to this institution?
Still want to be a college professor?

Three demographic variables were of primary interest in this analysis: discipline, gender, and institution type. Gender was examined as a dichotomous variable in this analysis due to the limited options (male and female) provided in the data set. While most studies examining gender limit their analysis to the binary categories of “male” and “female,” it could be argued other categories of gender could be examined. These dichotomous classifications are often based upon the biological assignment of an individual’s sex determined by their external anatomy, but may not accurately reflect an individual’s genetic sex or their gender. As Delphy (1993) states, we can think of one’s sex as the container, but their gender as the contents within the container. If these two systems of classification are in conflict for an individual how would a researcher presume to know how the question was answered (sex or gender), or whether omitted responses were possibly the result of an individual’s inability or lack of desire to be classified based on their anatomical structure. This analysis, unfortunately, was limited to the scope of variables in the HERI faculty survey, and unable to examine the larger framework of gender.

Disciplines in the analysis were recoded to classify academic disciplines as STEM or non-STEM based upon disciplines identified by the National Science Foundation (NSF) as STEM and previous studies (Carrigan et al, 2011; Canizares, 2009). Discipline codes from HERI 2013 defined as STEM were: agriculture or forestry, biological sciences, engineering, mathematics or statistics, and physical sciences. The percentage of faculty in STEM disciplines in HERI 2013 is 29.4% in all institutions, 39.6% at public universities, 22.9% at private universities, 23.6% at public colleges, and 23.7% at private colleges. Non-STEM faculty comprise the majority of faculty respondents ($n=11,589$). Of the STEM faculty, 35.6% ($n=1,608$) were women while 51% ($n=5,906$) of non-STEM faculty were women. An examination of the data set illustrates the inequity present in STEM faculty numbers across institutions. Men are more likely to hold STEM faculty positions at all institution types with the greatest differences within universities (public universities 43.6% men, 29.1% women, private universities 28.9% men, 14% women, Public colleges, 27.7% men, 19.3% women, and private colleges, 27.5% men and 17.9% women). This data also supports theories suggesting women faculty self-select into colleges (Trower & Chait, 2002, Schneider, 2000).

Institution types were aggregated in the HERI Faculty Survey into two categories: universities and colleges (Table 5). Universities were defined as institutions with Carnegie classification of research or doctoral institutions ($n = 4,973$), and all other baccalaureate institutions were classified as “colleges” ($n = 11,139$). Table 5 reports the demographic variables for this sample included as independent variables in this study, as well as their measurement.

Table 5 Demographic variables used in analysis

Demographics	
Gender	Dichotomous variable 0 = Male 1 = Female
Institutional Type	Dichotomous variable (Recoded) 0 = Universities (research intensive institutions) 1 = Colleges (non-research intensive institutions)
Academic discipline	Dichotomous variable (Recoded) 0 = Non-STEM 1 = STEM

Data Analysis

Descriptive and inferential statistics will be used to address the research questions in this study. Data analysis will be performed using IBM SPSS 24 and AMOS to specify and test the theoretical models. Once the sample was established, the faculty stress, job satisfaction, and intent to leave variables from the HERI Faculty Survey were individually examined for the distribution, central tendency, dispersion, means, standard deviation, normality, outliers, and missing data. The data was also screened for non-positive definite (NPD) data matrices, including collinearity, outliers, and missing cases. Multicollinearity was assessed using a variance inflation factor (VIF) greater than 10 (Kline, 2011). The sample was also examined for missing data. If there was evidence missing data was missing completely at random (MCAR) and the number of cases to be deleted is small, the sample was large enough not to have deletion of data impact power of analysis, then missing data was deleted list-wise. For each of the scales, Cronbach's coefficient alpha was calculated as a measure of internal consistency reliability. Cronbach's coefficient alpha values $>.7$ were established as acceptable levels of internal consistency (Murphy & Davidsholder, 1988).

Inferential statistics were then used to address the research questions in this study. Due to limited information on the dimensionality of the HERI instruments for the three

constructs of interest in this analysis (faculty stress, job satisfaction, and intent to leave), EFA was used to guide decisions pertaining to their use, and to operationalize the underlying constructs. EFA is often used as a data reduction technique to identify the underlying relationships between survey items with the ultimate goal of creating a more parsimonious analysis. While previous studies had identified four factors for faculty stress (Dey, 1994) and 2 factors for job satisfaction (Hurtado, et al., 2012), the indicators for stress have changed within the survey, the method used for generation of the HERI constructs was different, no examples of constructs for intent to leave were found, and as a result EFA is warranted in this analysis prior to additional analyses.

A preliminary EFA was performed for all items within each construct (stress, job satisfaction, and intent to leave). This was used to identify and establish the factor structure for each construct. The first step in this analysis is to examine the correlations between the items in the construct for moderate correlations ($> .30$) and multicollinearity (correlations $> .90$). Bartlett's test of sphericity was then examined for each construct. Bartlett's test is an indicator of the strength of the relationship between the variables, and tests whether the correlation matrix is an identity matrix, meaning the variables are uncorrelated. A statistically significant Bartlett's test indicates the correlations are adequate for EFA. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was also examined. Kaiser (1960) recommends a KMO value of .70 or greater as an adequate indicator of the applicability of EFA on the items. Communalities (h^2) were then examined. Communalities express the amount of variance in the item explained by the retained factors. Items with communalities $> .40$ were retained in the analysis, and items

with communalities less than .4 were dropped from further analysis (Gorsuch, 1983; Stevens, 2009).

Next, the criterion established by Kaiser (1960), Cattell (1966), and Horn (1965) were followed for retention of items in the factor structure. The first criterion examined was the Kaiser criterion in which factors with eigenvalues greater than one were retained (Kaiser, 1960). While considered quite accurate when the number of items is less than thirty, communalities are greater than .7, and $N > 250$, this criterion is considered a “rule of thumb” and can result in the retention of too many or too few factors and therefore additional criterion were used in determining number of factors to retain.. The second criterion evaluated was a scree test (Cattell, 1966). A scree test plots the eigenvalues along a y-axis of the number of factors creating a visual representation of the values. The number of factors to consider for retention would occur where the line of the eigenvalue data points becomes horizontal. The final criterion for determining the number of factors to retain was a parallel analysis (Horn, 1965). A parallel analysis compares the eigenvalues of the observed data to those generated by a random data set. Factors are retained as long as the observed eigenvalue is greater than the randomly generated eigenvalue. While these criteria for retention are useful for establishing a factor structure, the factors also needed to be interpretable and supported by theory.

The remaining items then entered a second EFA for each construct using maximum likelihood extraction with oblique (promax) rotation, as it is assumed the items to be related. While oblique rotations are more complicated than the standard orthogonal rotations, the factors in these constructs are related and therefore oblique rotation is required. The pattern and structure matrices were then examined. Pattern coefficients are

analogous to standardized regression coefficients that would be obtained using multiple regression, while structure coefficients measure the correlation between the observed and latent variables. Stevens (2009) recommends items with factor loadings greater than .40 to be included in the factor. Items with factor loadings less than .40 were not included in further analysis and a factor structure for each construct was determined through the examination of the rotated pattern and structure coefficient matrices.

After completion of the EFA, MIMIC modeling was performed to examine group differences in the constructs addressing RQ 1-3. MIMIC is a special case of SEM consisting of a measurement model defining the relationship between the latent construct and its indicators and a structural model which represents the casual relationships between the latent constructs and explains casual effects. In this analysis the factor structures developed using EFA were used to create subscales for faculty stress, job satisfaction, and intent to leave which were then used as the basis for MIMIC Models to compare faculty group differences. Each construct was tested in a separate MIMIC model. Model fit may be maximized by adding correlations among measurement-variable residuals using Lagrange multiplier modification index (Bentler, 1989). Modification indices were used to examine model fit. Chi-square (χ^2), SRMR (standardized root mean square residual) , RMSEA (root mean squared error of approximation), CFI (comparative fit index), and NFI (normed fit index) were examined for model fit with the understanding χ^2 values are sensitive to sample size and additional indices may be needed to determine model fit (Bentler, 1989). Most researchers agree (Brown, 2015) both CFA and SEM results should report model fit statistics from each of the three categories of fit indices (absolute fit, fit adjusting for model parsimony, and comparative fit). While χ^2 is

always reported in CFA and SEM analysis, it is very sensitive to sample size and as a result when an analysis has a large N , χ^2 will be statistically significant due to sample size alone indicating poor model fit. Chi-square remains important for model comparisons using χ^2 difference tests. In this analysis, SRMR was used as the absolute fit index. SRMR values $< .08$ indicate good model fit (Hu & Bentler, 1999). While RMSEA is sometimes considered an absolute fit index, Brown (2015) considers it a fit index of parsimony correction. Values of 0 for RMSEA would indicate perfect model fit. RMSEA values less than 0.08 were set as a cutoff for this analysis (Kline, 2011). The comparative fit index measures include CFI, and NFI were used in this analysis. NFI and CFI values $> .95$ indicate great model fit, while values $< .90$ indicate poor model fit (Hu & Bentler, 1999). Effect sizes were calculated using Hancock's (2001) standardized effect size estimate (\hat{d}) where:

$$\hat{d} = |\hat{\gamma}_{11}| / [v(\zeta_1)]^{1/2}$$

$\hat{\gamma}_{11}$ = path from covariate to construct

$v(\zeta_1)$ = pooled within groups factor variance

This effect size is equitable to Cohen's d and is defined as the estimated number of latent standard deviations separating two population means on the latent continuum of interest. Effect sizes of .1 were considered small, .3 moderate, and .5 or greater, large.

The MIMIC models developed for faculty stress, job satisfaction, and intent to leave were then used to generate a SEM model to address RQ 4. This model is a hybrid SEM model composed of three measurement models (one for each construct), and the path relationships between the constructs (Figure 5). Direct and indirect effects were examined in this model with bootstrapping used to determine significance of indirect

effects. The model predicted faculty stress would have both direct and indirect effects on faculty intent to leave.

Limitations

There are several limitations to consider with this study. First, any analysis of secondary data is limited to the variables included in the initial survey. While there are some previous studies using HERI Faculty Survey data other data sets have been used and as previously identified the HERI Faculty Survey itself has evolved over time.

Comparison to earlier models may also be problematic due to differences in variables between data sources. The HERI 2013 faculty survey sample focused solely on full time faculty with responsibilities for undergraduate instruction and as a result excluded faculty who teach graduate courses exclusively. For comparisons of universities and colleges this will likely impact the differences as faculty at research intensive institutions spend more time in research and are less likely to teach undergraduate courses (Astin & Snyder, 1982; Barbzat & Hughes, 2005; Bayer & Astin, 1975; Bellas & Toutkoushian, 1999; Nettles, et al., 2000; Toutkoushian, 1999), and women faculty spend less time in research and are more likely to teach undergraduate courses than men (Bayer & Astin, 1975; Bellas & Toutkoushian, 1999; Carrigan, et al., 2011; Nettles et al., 2000; Perna, 2001a). This limitation narrows the focus of the analysis but because of smaller numbers of women teach graduate classes sample size would have potentially been small for this group. Further studies will be needed to examine women faculty teaching at the graduate level.

Although HERI is a nationally normed data set, the results of this study may not be repeatable/applicable to individual institutions but could be used as a guide for institution-level analyses. Additionally, due to the stratification sampling of HERI the

authors caution standard errors may be larger than actual standard errors due to non-random variation. The authors do provide estimates of standard errors for comparison groups in order to derive estimate confidence intervals (See Hurtado et al., 2012 Appendix D Table 1).

CHAPTER IV

RESULTS

Introduction

The purpose of this study was to examine group differences, based on gender, discipline, and institution type, in faculty perceptions of stress, job satisfaction, and their intent to leave, as well as the structural these constructs. This chapter is organized in the order of the four research questions presented in Chapter 3. It first examines the impact of gender, discipline, and institution on faculty stress, then follows with the same examination of both job satisfaction and intent to leave. The chapter concludes by examining the structural relationship between faculty stress, job satisfaction, and intent to leave and the effects of gender, discipline, and institution type on this relationship.

Tables 6 – 8 present the descriptive statistics for faculty stress, job satisfaction, and intent to leave, respectively. Table 6 shows the 19 items found in the HERI Faculty Survey measuring faculty stress. These items were measured on a 4-point Likert scale where a score of 1 equaled the item was not applicable to the individual, and a score of 4 equaled the item was an extensive source of stress. Lack of personal time, self-imposed high expectations, and change in work responsibilities were most frequently reported as sources of “extensive” faculty stress, while stress due to students was the least likely to be reported as a source of extensive stress. Self-imposed high expectations was the

highest reported mean source of faculty stress for both genders, while child care was the lowest reported source of stress or least applicable source of stress, for faculty. For all items except two, (child care and institutional procedures and “red tape”) women had higher reported mean stress scores.

Table 6 Descriptive statistics (means (SD)) for 2013-2014 HERI Faculty Survey items related to faculty stress by gender.

Stress Items*	Men <i>n</i> =7415	Women <i>n</i> =6729
Managing Household Responsibilities	2.86 (.725)	3.04 (.707)
Child Care	1.95 (1.01)	1.87 (1.10)
My physical health	2.58 (.685)	2.64 (.726)
Review/promotion process	2.60 (.881)	2.75 (.923)
Subtle discrimination	2.13 (.664)	2.44 (.785)
Personal finances	2.75 (.727)	2.78 (.751)
Committee work	2.71 (.708)	2.78 (.745)
Faculty meetings	2.60 (.689)	2.67 (.721)
Colleagues	2.66 (.679)	2.77 (.699)
Students	2.63 (.607)	2.73 (.605)
Research or publishing demands	2.83 (.785)	2.91 (.853)
Institutional procedures and “red tape”	2.99 (.719)	2.94 (.736)
Teaching load	2.75 (.734)	2.83 (.754)
Lack of personal time	2.92 (.725)	3.18 (.712)
Job security	2.40 (.673)	2.50 (.719)
Working with underprepared students	2.71 (.661)	2.73 (.666)
Self-imposed high expectations	3.14 (.688)	3.24 (.662)
Change in work responsibilities	2.93 (.730)	3.11 (.735)
Institutional budget cuts	2.84 (.809)	2.92 (.814)

*Measured on a 4-point Likert scale where 1 = not applicable, 2 = not at all, 3 = somewhat, and 4 = extensive

Job satisfaction was measured on a 20 item scale using a 5-point Likert measure where 1 equaled the item was not applicable to the individual and 5 equaled they were very satisfied with the item (Table 7). All items had means greater than the average possible score except for one (availability of child care at this institution) indicating faculty are generally satisfied. Faculty were most satisfied with their freedom to determine course content, and their autonomy and independence. The lowest mean scores

for satisfaction were related to salary and benefits (with the exception of availability of childcare). Women had lower mean satisfaction scores in 16 out of the 20 items.

Table 7 Descriptive statistics (means (SD)) for 2013-2014 HERI Faculty Survey items related to Faculty job satisfaction by gender.

Job Satisfaction items*	Men <i>n</i> =7415	Women <i>n</i> =6729
Salary	3.44 (.977)	3.33 (.959)
Health benefits	3.81 (.952)	3.74 (1.02)
Retirement benefits	3.82 (.931)	3.77 (.931)
Opportunity for scholarly pursuits	3.56 (1.00)	3.35 (.987)
Teaching load	3.57 (.993)	3.45 (1.00)
Quality of students	3.69 (.919)	3.77 (.874)
Office/lab space	3.84 (1.01)	3.87 (1.03)
Autonomy and independence	4.26 (.818)	4.24 (.807)
Professional relationships with other faculty	4.10 (.898)	4.12 (.889)
Competency of colleagues	4.10 (.856)	4.15 (.820)
Job security	4.20 (.945)	4.05 (.978)
Departmental leadership	3.96 (1.04)	3.85 (1.09)
Course assignments	4.15 (.851)	4.10 (.884)
Freedom to determine course content	4.49 (.781)	4.43 (.838)
Availability of child care at this institution	1.62 (1.10)	1.60 (1.03)
Prospects for career advancement	3.41 (1.13)	3.32 (1.10)
Clerical/administrative support	3.71 (1.04)	3.63 (1.06)
Overall job satisfaction	4.02 (.835)	3.94 (.812)
Relative equity of salary and job benefits	3.47 (1.02)	3.29 (.994)
Flexibility in relation to family matters or emergencies	4.18 (.979)	4.06 (1.03)

*Satisfaction items were measured on a 5-point Likert scale where 1=not applicable, 2 = not satisfied, 3 = marginally satisfied, 4 = satisfied, and 5=very satisfied.

Six questions were identified in the HERI Faculty Survey related to faculty intent to leave. Four of these items were measured on a yes/no scale where a score of one was coded to mean yes and a score of zero meant no (Table 8). The means for these items indicate faculty were more likely to consider leaving their current institution more than leaving academia entirely, although women were more likely to consider leaving academia than men. Very few faculty reported receiving a firm job offer, or they had sought an early promotion. The final two items asked faculty whether or not they would do their career over if given the opportunity. Both of these items were measured on a 5-point Likert scale where a score of 1 equaled “definitely yes” and a score of 5 equaled

“definitely no” the individual would either want to return to this institution or become a college professor if they could do it over again. Faculty were more likely to consider not returning to the same institution than to not become a college professor again.

Table 8 Descriptive statistics (means (SD)) for 2013-2014 HERI Faculty Survey items related to faculty intent to leave by gender. Higher mean values for each item indicates greater intent to leave.

Intent to Leave items	Men n=7415	Women n=6729
Considered Leaving Academe‡	.33 (.469)	.39 (.487)
Considered Leaving Institution‡	.49 (.500)	.48 (.500)
Received at least one firm job offer‡	.18 (.387)	.18 (.385)
Sought an early promotion‡	.06 (.236)	.05 (.226)
Still want to come to this Institution	2.10 (1.10)	2.13 (1.08)
Still want to be a College Professor	1.55 (.821)	1.62 (.851)

Intent to leave items were measured on either a yes/no scale as indicated (‡) where 1=yes, 0=no or a 5-point Likert scale recoded to 1=definitely yes, 2= probably yes, 3 = not sure, 4 = probably no, and 5=definitely no.

After the study sample ($n = 14,144$) was identified from the full 2013 HERI Faculty Survey data set ($N=16,112$) it was divided into faculty groups based upon gender, discipline, and institution type. Examination of the resulting group sizes revealed the sample sizes for each group was sufficiently large enough for further analysis without further sub-sampling (Table 9). The group sample sizes illustrate women faculty continue to be underrepresented in university positions, especially STEM university positions while they are more likely to be represented in college positions including STEM.

Table 9 Percentage of men and women in each faculty group in the sample taken from the 2013 HERI Faculty Survey sample based upon gender, discipline, and institution type

Institution Type	Men	Women
Non-STEM University	21.3	20.2
Non-STEM College	42.6	48.4
STEM University	15.6	9.4
STEM College	20.5	22
(n= 14144) Total	7415	6729

Research Question 1: Gender, Discipline, and Institutional Differences in Faculty Stress

In this section, results are reported for research question 1. First, factor analytic findings are provided regarding the factor structure of the measurement instruments. Subsequently empirical findings based on MIMIC modeling is provided that address the research question.

EFA analysis for faculty stress. Reliability of the faculty stress scale was measured by Cronbach's alpha coefficient ($\alpha = .80$), which indicated good reliability within the items. EFA using maximum likelihood extraction and promax rotation with Kaiser Normalization was performed on the 19 Stress scale items. After dropping stress items with very low communalities or factor loadings, including two items not loading on any factor, the Kaiser-Meyer-Olkin measure of sampling adequacy for the remaining 11 items was .726 indicating the sample was suitable for EFA. Similarly, Bartlett's test of sphericity was significant ($p < .001$), indicating sufficient correlation between the items to proceed with the analysis.

Using the Kaiser-Guttman retention criteria of eigenvalues greater than 1, a four factor solution was examined explaining 61.8% of the total variance in stress. The Scree plot supported the retention of four factors, however, studies have previously concluded parallel analysis is the most conclusive method of factor retention criteria (Henson & Roberts, 2006), therefore, parallel analysis was performed using SPSS syntax which indicated a four factor solution was supported with the criteria of 11 items, sample size of 14,144, and through 1,000 iterations. While Dey's (1994) factor analysis using the HERI 1989-1990 Faculty Survey also found four factors, this study warranted the EFA because the survey items had changed considerably and while four factors were retained in this

analysis, significant differences were found in the current the factor structure compared to this previous analysis.

Work. Factor 1 was named Work and included four items related to faculty work life (faculty meetings, committee work, colleagues, and change in work responsibilities). While this factor corresponded to Dey's (1994) factor Governance Activities, Dey's factor was only composed of the items faculty meetings, committee work, and colleagues, this analysis added the item change in work responsibilities to the factor. The item colleagues did not cross load in this analysis as it had in Dey's (1994) study. Overall, the factor Work accounted for 27.2% of the variance in faculty stress (Table 10).

Home. Factor 2 was named Home and included three items related to faculty home life (managing household responsibilities, child care, and lack of personal time). This factor deviated from the factors derived by Dey (1994), and is best described as a combination of Dey's factors previously named Time Constraints and Home Responsibilities. Three of the items included in the original two factors from Dey's analysis are no longer included in the HERI Faculty Survey (children's problems, marital friction, and time pressures). Work accounted for 13.2% of the variance in faculty stress.

Students. Factor 3 was not represented in Dey's study and included the items students and working with underprepared students; this factor was named Students as a result. While the item students was in the 1989 HERI Faculty Survey, working with underprepared students was not. Students accounted for 11.3% of the variance in stress.

Promotion. The final factor was named Promotion and included the two items review/promotion process and job security. While Dey's study included an item named Promotion Concerns the only similarity between the factors was the item

review/promotion process. Two items included in this factor in the earlier study were dropped from the analysis due to low factor loadings (research and publishing demands and subtle discrimination) and the item job security was not present in the 1989 HERI Faculty Survey. Promotion accounted for 10.1% of the variance in stress

Table 10 Exploratory Factor Analysis results for Faculty Stress Scale from 2013 HERI Faculty Survey with Promax rotation.

Item	h^2	Factor			
		Work	Home	Students	Promotion
Faculty meetings	.565	.813(.738)			
Committee work	.504	.729(.701)			
Colleagues	.273	.479(.509)			
Change in work responsibilities	.297	.414(.509)			
Managing Household Responsibilities	.592		.785(.769)		
Child Care	.260		.558(.492)		
Lack of personal time	.354		.385(.528)		
Students	.718			.874(.846)	
Working with underprepared students	.254			.492(.501)	
Review/promotion process	.257				.868(.843)
Job security	.719				.439(.482)
Eigenvalues		3.00	1.45	1.25	1.11
Percentage of variance explained		27.2	13.2	11.3	10.1

Structure coefficient is shown in parentheses. h^2 = communality

CFA analysis for faculty stress. The results of the EFA on the faculty stress items were then used to generate a CFA model using IBM's SPSS AMOS version 23.0 (Figure A1). After initial analysis of the model, modification indices supported the addition of intrafactor error covariances within factor 1 and 2 to improve model fit. While some researchers frown upon the application of error covariances for improvement of model fit (Gerbing & Anderson, 1984), the items correlated are highly related (Figure A2) Model fit for the four factor stress scale was mixed (χ^2 [34] =2879.5, $p < .001$, RMSEA = .077, CFI =.898, SRMR = .05). Chi-square value for the CFA model of faculty stress was statistically significant ($p < .001$) indicating poor model fit, however the large sample size in this analysis made chi-square a poor measure of model fit (Bentler & Bonnet, 1980). While RMSEA values did not met the .06 threshold

recommended by Hu and Bentler (1999), they did meet the .08 acceptable fit threshold recommended by Loehlin and Beaujean (2016). SRMR also indicated acceptable model fit, even though CFI was low. Examination of the standardized residual covariances indicated there was some inter-item interactions occurring in the model, which was understandable due to the closely related nature of several of the items. Model fit was also impacted by the presence of two factors with only two items loading on each factor.

MIMIC analysis for faculty stress. The final CFA model was then used to examine the effects of gender, discipline, and institution type on the factors of faculty stress through MIMIC analysis. Two MIMIC models were analyzed separately with the first MIMIC model examining the effects of the individual variables ($\chi^2 [58] = 3666.7, p < .001, RMSEA = .066, CFI = .877, SRMR = .045$) (Figure A4) while the second MIMIC model examined the two-way interactions of gender, discipline, and institution ($\chi^2 [55] = 3502.3, p < .001, RMSEA = .067, CFI = .927, SRMR = .045$) (Figure A5) (below Table 11).

Research question 1 sought to examine differences in faculty perceptions of stress based upon differences in gender, discipline, and institution type. Gender had the greatest effect on faculty perceptions of stress (below). Women were more stressed with Work ($\beta = .129, ES = .26, p < .001$), Home ($\beta = .164, ES = .33, p < .001$), Promotion ($\beta = .118, ES = .24, p < .001$), and Students ($\beta = .082, ES = .17, p < .001$). While discipline had a statistically significant effect on three factors the ES were small ($\leq .10$). STEM faculty were less stressed by Work ($\beta = -.025, ES = .05, p < .01$), more stressed by Home ($\beta = .041, ES = .09, p < .001$), and Students ($\beta = .047, ES = .10, p < .001$). Institution had a significant effect on all four factors with the largest effect on Students (Table 11).

College faculty were more stressed by Home ($\beta = .057$, $ES = .12$, $p < .001$), and Students than university faculty ($\beta = .111$, $ES = .24$, $p < .001$).

While the two-way interactions of gender, discipline, and institution had significant effects on faculty perception of stress the effect sizes were generally small ($\leq .10$) (Table 6). Women at colleges were more likely to be stressed with Work ($\beta = .13$, $ES = .11$, $p < .001$), Home ($\beta = .122$, $ES = .11$, $p < .001$), and Students ($\beta = .165$, $ES = .15$, $p < .001$), than other faculty groups. Women in STEM were more stressed about Promotion ($\beta = .061$, $ES = .02$, $p < .001$), and while the effects were weak were more stressed with Home and less stressed with Students ($\beta = .068$, $ES = .06$, $p < .001$). Discipline and institution had weak, but significant effects on three out of four factors. STEM faculty at colleges were less stressed with Work ($\beta = -.037$, $ES = .01$, $p < .001$), and Promotion ($\beta = -.074$, $ES = .02$, $p < .001$), and more stressed with Students ($\beta = .083$, $ES = .02$, $p < .001$).

Table 11 Model Standardized Factor Loadings for CFA and MIMIC analyses and β values (ES) for each of the Covariates within each MIMIC Model of Faculty Stress for 2013 HERI Faculty Survey.

		MIMIC			MIMIC			Gender/	Gender/	Discipline/
		Model	Gender	Discipline	Institution	Model	Discipline	Institution	Institution	
		1 [‡]	β (ES)	β (ES)	β (ES)	2 [‡]	β (ES)	β (ES)	β (ES)	
Factor 1: Work			.129*(.26)	-.025**(.05)	.037*(.08)		NS	.130*(.11)	-.037*(.01)	
	Faculty meetings	.515	.514			.514				
	Committee work	.574	.571			.570				
	Colleagues	.713	.708			.709				
	Change in work responsibilities	.696	.700			.701				
Factor 2: Home			.164*(.33)	.041*(.09)	.057*(.12)		.061*(.02)	.122*(.11)	NS	
	Managing Household Responsibilities	.599	.596			.596				
	Child Care	.514	.490			.490				
	Lack of personal time	.753	.762			.762				
Factor 3: Promotion			.118*(.24)	NS	-.045*(.10)		.129*(.12)	NS	-.074*(.02)	
	Review/promotion process	.813	.786			.787				
	Job security	.521	.538			.538				
Factor 4: Students			.082*(.17)	.047*(.10)	.111*(.24)		-.068*(.06)	.165*(.15)	.083*(.02)	
	Students	.752	.762			.747				
	Working with underprepared students	.523	.527			.527				

[‡]Factor loadings for each of the stress items for each model. ES = effect size as calculated by Hancock (2004). Gender 1 = women, Discipline 1 = STEM, and Institution 1 = college. * significant at $p < .001$ ** significant at $p < .01$

Research Question 2: Gender, Discipline, and Institutional Differences in Faculty Job Satisfaction

In this section, I report results for research question 2. First, factor analytic findings are provided regarding the factor structure of the measurement instruments. Subsequently empirical findings based on MIMIC modeling is provided that address the research question.

EFA analysis for job satisfaction. Reliability, or internal consistency, for the 20 job satisfaction survey items was $\alpha = .88$, indicating good reliability of the items. EFA using Maximum Likelihood extraction and promax rotation was performed on the 20 Job Satisfaction items. The initial EFA had a $KMO = .920$, and Bartlett's test was significant, but four items had extremely low communalities and/or did not load on any of the 5 initially extracted factors. These four items were dropped from the analysis as a result (office/lab space, job security, availability of childcare at this institution, and flexibility in relation to family matters or emergencies). The EFA was repeated and two additional items did not load on any of the three extracted factors and were dropped (clerical and administrative support, and quality of students). An additional 2 items cross-loading on two different factors were also dropped from the model (overall satisfaction, and teaching load) along with one item (autonomy and independence) which was dropped due to a factor loading below .40. The final EFA on the remaining 10 Job Satisfaction items extracted onto three factors explaining 64.2% of the variance in job satisfaction. The KMO for this analysis was .793 and Bartlett's test was significant ($p < .001$). Parallel analysis confirmed this three factor structure.

Five items loaded onto factor 1 and were all related to Salary & Benefits (salary, relative equity of salary and job benefits, retirement benefits, health benefits, and

opportunity for scholarly pursuits) (Table 12). This factor explained 37.5% of the variance in job satisfaction. The second factor included three items all related to interpersonal relationships experienced by faculty (professional relationships with other faculty, competency of colleagues, and departmental leadership), and was named Relationships, and explained an additional 16.3% of the variance in satisfaction. The final factor included two items related to the faculty role teaching (freedom to determine course content, and course assignments), and was named Teaching. This factor explained and additional 10.4% of the variance in job satisfaction.

Table 12 Exploratory Factor Analysis results for Faculty Job Satisfaction Scale from 2013 HERI Faculty Survey with Promax rotation.

	Factor			
		Salary & Benefits	Relationships	Teaching
Salary	.718	.896(.841)		
Relative equity of salary and job benefits	.718	.824(.828)		
Retirement benefits	.293	.519(.539)		
Health benefits	.237	.485(.487)		
Opportunity for scholarly pursuits	.332	.460(.550)		
Professional relationships with other faculty	.694		.851(.832)	
Competency of colleagues	.593		.785(.769)	
Departmental leadership	.333		.392(.534)	
Freedom to determine course content	.393			.957(.934)
Course assignments	.874			.604(.626)
Eigenvalues		3.75	1.63	1.04
Percentage of variance explained		37.5	16.3	10.4

Structure coefficient is shown in parentheses. h^2 = communality

CFA analysis for job satisfaction. The three factors extracted during the EFA were then examined using IBM SPSS AMOS version 23 (Figure A3). Modification indices showed a very high within factor error correlation was present between e3 & e4. These items are very highly related both dealing with benefits and as a result, a factor error correlation was added between these errors improving model fit (χ^2 [31] =2155.7, p < .001, RMSEA = .07, CFI =.954, SRMR = .049).

MIMIC analysis for job satisfaction. Following the same process used in the analysis of Stress, Job Satisfaction was examined in two separate MIMIC analyses to address RQ 2. MIMIC 1 examined the effects of gender, discipline, and institution on the factors of Job Satisfaction ($\chi^2 [55] = 3344.4, p < .001, RMSEA = .065, CFI = .931, SRMR = .045$), and the second examined the two-way interactions of these variables on the same model ($\chi^2 [52] = 3164.1, p < .001, RMSEA = .065, CFI = .953, SRMR = .041$) (Figure A6 and A7) (Table 13).

The effects of gender, discipline, and institution type on job satisfaction were generally small. Women were less satisfied with Salary & Benefits ($\beta = -.087, ES = .18, p < .001$) and Teaching ($\beta = -.048, ES = .10, p < .001$), but no significant effect of gender occurred on Relationships. STEM faculty were more satisfied with Salary & Benefits ($\beta = .051, ES = .11, p < .001$) and their Relationships ($\beta = .041, ES = .09, p < .001$), but less satisfied with Teaching ($\beta = -.062, ES = .13, p < .001$). College faculty were less satisfied with Salary & Benefits ($\beta = -.081, ES = .17, p < .001$), but more satisfied with their Relationships ($\beta = .055, ES = .12, p < .001$) and Teaching ($\beta = .088, ES = .19, p < .001$).

The two-way interactions of gender, discipline, and institution also had significant effects on faculty perception of job satisfaction. Women in STEM were more satisfied with Salary & Benefits ($\beta = .105, ES = .10, p < .001$), but were less satisfied with their Relationships ($\beta = -.046, ES = .04, p < .001$) and Teaching ($\beta = -.223, ES = .21, p < .001$). Women at colleges were less satisfied with their Salary & Benefits ($\beta = -.206, ES = .23, p < .001$), but more satisfied with their Relationships ($\beta = .055, ES = .05, p < .01$) and Teaching ($\beta = .176, ES = .16, p < .001$). STEM faculty at colleges were more satisfied

with their Relationships ($\beta = .048$, ES = .02, $p < .001$) and Teaching ($\beta = .048$, ES = .01, $p < .001$).

Table 13 Model Standardized Factor Loadings for CFA and MIMIC analyses and β values (ES) for each of the Covariates within each MIMIC Model of Faculty Job Satisfaction for 2013 HERI Faculty Survey.

	CFA	MIMIC Model 1	Gender β (ES)	Discipline β (ES)	Institution β (ES)	MIMIC Model 2	Gender/Discipline β (ES)	Gender/Institution β (ES)	Discipline/Institution β (ES)
Factor 1: Salary & Benefits			-.087*(.18)	.051*(.11)	-.081*(.17)		.105*(.10)	-.206*(.23)	NS
Salary	.822	.820				.821			
Relative equity of salary & Benefits	.851	.847				.847			
Retirement benefits	.509	.512				.512			
Health benefits	.451	.453				.454			
Opportunity for Scholarly Pursuits	.554	.561				.561			
Factor 2: Relationships			NS	.041*(.09)	.055*(.12)		-.046*(.04)	.055**(.05)	.048*(.02)
Professional relationships w/ other faculty	.812	.813				.813			
Competency of Colleagues	.766	.765				.765			
Departmental Leadership	.566	.565				.565			
Factor 3: Teaching			-.048*(.10)	-.062*(.13)	.088*(.19)		-.223*(.21)	.176*(.16)	.048*(.01)
Course Assignments	.866	.847				.848			
Freedom to determine course content	.673	.688				.688			

#Factor loadings for each of the stress items for each model. ES = effect size as calculated by Hancock (2004). Gender 1 = women, Discipline 1 = STEM, and Institution 1 = college. *significant at $p < .001$ ** significant at $p < .01$

Research Question 3: Gender, Discipline, and Institutional Differences in Faculty Intent to Leave

In this section, results are reported for research question 3. First, factor analytic findings are provided regarding the factor structure of the measurement instruments. Subsequently empirical findings based on MIMIC modeling is provided that address the research question.

The 2014 HERI Faculty Survey included six possible items related to faculty intent to leave. Two items were determined to be irrelevant to the analysis on intent due to low numbers responding with intent and were not included in further analysis (received firm job offer and sought early promotion). Cronbach's alpha for the remaining four items was .691. While this alpha value was slightly below the .7 cut-off often cited for scale reliability (Nunnally & Bernstein, 1978), the low number of items is the most likely reason for this lower value and other authors have cited .6 as acceptable (Taber, 2016).

EFA analysis for intent to leave. Similar to the alpha values, the *KMO* for the four Intent items was low ($KMO = .651$), but still is greater than the .6 cut-off required to perform EFA (Kaiser, 1974). Bartlett's test of sphericity was significant ($p < .001$), indicating sufficient correlation between the items to proceed with the analysis. All four items loaded onto one factor explaining 52.1% of the variance in intent to leave. Factor loadings ranged from 0.48 (Item 4: Still want to be a college professor) to 0.696 (Item 1: considered leaving academia), with communality estimates ranging from 0.23 (Item 4: Still want to be a college professor) to 0.48 (Item 1: considered leaving academia).

CFA for intent to leave. The four item factor was then used to generate a CFA model in AMOS (Figure A3). Even with the large sample size in this analysis the χ^2 test

was not significant indicating good model fit ($\chi^2 [1] = 5.51, p = .019, RMSEA = .018, CFI = 1.00, SRMR = .004$). This model was then used to perform MIMIC analysis on the one-way and two-way interactions of gender, discipline, and institution to address RQ 3 (Table 14).

While the χ^2 statistic was significant for MIMIC model 1 (Figure A8) (Table 14), this is likely due to the large sample size; all other fit indices support good model fit ($\chi^2 [13] = 347.6, p < .001, RMSEA = .043, CFI = .968, SRMR = .027$). In this model, institution did not have a significant effect on intent to leave (Table 9). Women had a higher intent to leave than men ($\beta = .033, ES = .07, p < .001$), and STEM faculty were less likely to have intent to leave ($\beta = -.027, ES = .06, p < .001$).

The model fit indices for the second MIMIC analysis were very similar to the first MIMIC, indicating good model fit ($\chi^2 [10] = 176.0, p < .001, RMSEA = .034, CFI = .994, SRMR = .021$). The two-way interactions of gender/discipline and gender/institution were not significant on faculty intent to leave (Table 9). However, STEM faculty at colleges exhibited lower intent to leave than other discipline/institution groups, although effect sizes were minimal ($\beta = -.045, ES = .01, p < .001$).

Table 14 Model Standardized Factor Loadings for CFA and MIMIC analyses and β values (ES) for each of the Covariates within each MIMIC Model of Faculty Intent to Leave for 2013 HERI Faculty Survey.

	CFA [‡]	MIMIC Model 1 [‡]	Gender β (ES)	Discipline β (ES)	Institution β (ES)	MIMIC Model 2 [‡]	Gender/ Discipline β (ES)	Gender/ Institution β (ES)	Discipline/ Institution β (ES)
Factor 1: Intent			.033*(.07)	-.027**(.06)	NS		NS	NS	-.045*(.01)
Considered Leaving Academe for another Job?	.616	.615				.615			
Considered Leaving Institution for another?	.758	.758				.758			
Still want to come to this Institution?	.558	.558				.558			
Still want to be a College Professor?	.629	.630				.630			

[‡]Factor loadings for each of the stress items for each model. ES = effect size as calculated by Hancock (2004). Gender 1 = women, Discipline 1 = STEM, and Institution 1 = college. *significant at $p < .001$ ** significant at $p < .01$

Research Question 4: Structural differences in the Relationship between Faculty Stress, Job Satisfaction, and Intent to Leave

In this section, results are reported for research question 4. First, a structural equation model was generated to examine the relationship between faculty stress, job satisfaction, and intent to leave (Figure1). Subsequently, empirical findings based on hybrid MIMIC modeling are provided that address the research question.

Figure 5 illustrated the proposed relationship between the constructs while Figure 6 shows the final SEM model. Initial model fit was poor ($\chi^2 [18] = 2497.3, p < .001$, RMSEA = .099, CFI = .919, SRMR = .058) and modification indices indicated there was a very strong relationship between the stress factors Work and Promotion; as a result, the errors for these factors were correlated significantly improving model fit ($\chi^2 [17] = 1360.4, p < .001$, RMSEA = .075, CFI = .956, SRMR = .042).

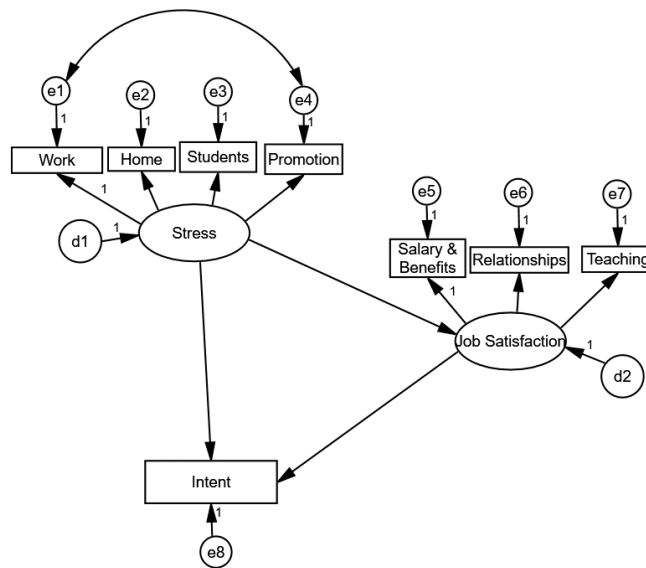


Figure 6. SEM model of Stress, Job Satisfaction, and Intent to Leave

The final model (Figure 6) explained 40.6% of the variance in faculty intent to leave. Results indicated faculty stress had a negative impact on job satisfaction ($\beta = -.464, ES = .75, p < .001$), indicating increased stress leads to decreased job satisfaction

(Table 15). Job satisfaction also had a negative impact on intent to leave (i.e., increased job satisfaction leads to decreasing intent to leave) ($\beta = -.525$, $ES = 1.1$, $p < .001$). Stress also had direct and indirect impacts on intent. Increases in stress directly resulted in increases in intent to leave ($\beta = .192$, $ES = .37$, $p < .001$), but stress had a total effect on intent of .436. Over half (56%) of the total effect of faculty stress on faculty intent to leave was the result of the indirect effect of stress through job satisfaction ($\beta = .243$, $ES = .45$, $p = .001$). This indicates the effects of stress are greater due to the mediating effects of job satisfaction and the indirect effects of stress on intent to leave are greater than the direct effects.

The second hybrid SEM model (Figure A10) added the effects of gender, discipline, and institution to the initial model Figure 6. SEM model of Stress, Job Satisfaction, and Intent to Leave). Model fit statistics indicate good model fit ($\chi^2 [35] = 2133.0$, $p < .001$, $RMSEA = .065$, $CFI = .934$, $SRMR = .040$). Gender, discipline, and institution all had significant direct effects on stress, and job satisfaction, but did not have significant direct effects on intent to leave (Table 15 Standardized regression weights and effect sizes for SEM model of Faculty Stress, Job Satisfaction, and Intent to leave. Table 15). Women had higher levels of stress ($\beta = .156$, $ES = .32$, $p < .001$). Interestingly, women had increased levels of job satisfaction, although the effect sizes were small ($\beta = .032$, $ES = .06$, $p < .001$). STEM faculty had lower levels of stress ($\beta = -.02$, $ES = .06$, $p < .001$), and higher levels of job satisfaction ($\beta = .018$, $ES = .04$, $p < .001$) compared to non-STEM faculty. College faculty had higher levels of stress ($\beta = .065$, $ES = .15$, $p < .001$), and higher levels of job satisfaction ($\beta = .058$, $ES = .11$, $p < .001$) compared to university faculty.

Several significant indirect effects were also seen in this model. The indirect effect of stress resulted in women having an overall decrease in job satisfaction ($\beta = -.073$, $ES = .13$, $p = .001$). So while women had higher job satisfaction the effect of their increased stress ultimately outweighs their satisfaction. Women also had significant indirect effects resulting in increased intent to leave ($\beta = .052$, $ES = .13$, $p = .001$) even though the direct effect of gender on intent to leave was not significant ($\beta = -.012$, $p = .093$). This indicates the higher levels of stress in women offset the increased levels of job satisfaction making them more likely to leave even when they are more satisfied than their male counterparts. STEM faculty also had an indirect increased job satisfaction through their decreased levels of Stress ($\beta = .010$, $ES = .02$, $p = .028$), and decreased intent to leave ($\beta = -.018$, $ES = .06$, $p = .002$). Additionally, college faculty had lower levels of job satisfaction as an indirect effect of their higher levels of stress ($\beta = -.031$, $ES = .06$, $p = .001$).

The final model (Figure A11) examined the two-way interactions of gender, discipline, and institution on the hybrid SEM model ($\chi^2 [32] = 1964.0$, $p < .001$, $RMSEA = .065$, $CFI = .961$, $SRMR = .037$) (Figure A11). Similarly to the previous model none of the two-way interactions had a significant impact on intent to leave (Table 15).

Women in colleges had higher levels of stress ($\beta = .183$, $ES = .21$, $p = .001$), and higher levels of job satisfaction ($\beta = .092$, $ES = .09$, $p = .001$). Women in STEM disciplines exhibited lower levels of job satisfaction ($\beta = -.054$, $ES = .04$, $p = .001$), while STEM faculty at colleges had higher levels of job satisfaction ($\beta = .049$, $ES = .01$, $p = .001$).

There were no significant direct effects of the two-way interactions on intent to leave. The combinations of gender, discipline, and institution all had significant indirect

effects, although effect sizes were small. STEM faculty at colleges had lower intent to leave ($\beta = -.033$, $ES = .01$, $p = .001$) as a result of their increased job satisfaction.

Women in colleges had higher intent to leave ($\beta = .033$, $ES = .05$, $p = .003$), due to their increased levels of stress. Women in STEM disciplines also had higher intent to leave ($\beta = .025$, $ES = .03$, $p = .023$), due to their decreased job satisfaction. Women in colleges also had lower levels of job satisfaction as result of their increased levels of stress ($\beta = -.086$, $ES = .09$, $p = .001$).

Table 15 Standardized regression weights and effect sizes for SEM model of Faculty Stress, Job Satisfaction, and Intent to leave.

		MIMIC			MIMIC			Gender/	Gender/	Discipline/
	SEM‡	Model	Gender	Discipline	Institution	Model	Discipline	Institution	Institution	
		1‡	β (ES)	β (ES)	β (ES)	2‡	β (ES)	β (ES)	β (ES)	
Stress			.156*(.32)	-.020***(.06)	.065*(.15)		NS	.183*(.21)	NS	
Job Satisfaction	-.464* (.75)	-.471* (.80)				-.472* (.80)				
Intent to Leave	.192* (.37)	.196* (.37)				.197* (.37)				
Indirect effects	.243* (.45)	.246* (.46)				.246* (.46)				
Job Satisfaction			.032*(.06)	.018***(.04)	.058*(.11)		-.054*(.04)	.092*(.09)	.049*(.01)	
Indirect effects			-.073*(.13)	.010***(.02)	-.031*(.06)		NS	-.086*(.09)	NS	
Intent to Leave	-.525* (1.1)	-.523* (1.1)				-.522* (1.1)				
Intent to Leave			NS	NS	NS		NS	NS	NS	
Indirect effects			.052*(.13)	-.018**(.06)	NS		.025***(.03)	.033**(.05)	-.033*(.01)	

Effect sizes in parentheses as calculated by Hancock (2004). Gender 1 = women, Discipline 1 = STEM, and Institution 1 = college.

*significant at $p < .001$ ** significant at $p < .01$ *** significant at $p < .05$

CHAPTER V

DISCUSSION

This study was designed to examine the effects of gender, discipline, and institution type on faculty stress, job satisfaction, and intent to leave in order to better understand why faculty representation of women STEM disciplines remains low. Four research questions were proposed; the first three research questions asked if there were differences in the perception of the three constructs of interest: faculty stress, job satisfaction, and intent to leave, based upon gender, discipline, and institution type. The final research question examined the relationship between the constructs and the effects of gender, discipline, and institution type on this relationship. The HERI 2013 Faculty Survey was used to examine the factor structure for each construct, and MIMIC analysis was used to examine differences in faculty perception of each of the constructs. SEM was then used to examine the relationship between these constructs and finally, the impact of gender, discipline, and institution type on the SEM model were examined.

Results from this study indicate gender, discipline, and institution effect faculty stress, job satisfaction, and most often indirectly, intent to leave. Overall, results of this analysis support previous studies in finding that women faculty generally have higher levels of stress (Blix et al., 1994; Catano et al., 2010; Gmelch et al., 1986; Winefield et al., 2008), are less satisfied (August & Waltman, 2004; Bilimoria et al., 2006; Bozeman

& Gaughan, 2011; Hagedorn, 1996, & 2000; Hagedorn & Sax, 2003; Rosser, 2004; Sabharwal & Corley, 2009; Seifert & Umbach 2008; Settles et al., 2006), and have greater intent to leave than men (Barnes et al., 1998; Hagedorn, 1996; Johnsrud & Heck, 1994; Gardner, 2013; Smart, 1990; Silander et al., 2012; Walters & McNeely, 2010; Zhou & Volkwein, 2004). The MIMIC analysis on stress, job satisfaction, and intent to leave illustrated faculty groups perceive stress, job satisfaction, and intent to leave differently and the interactive effects of gender, discipline, and institution type also impact these perceptions.

RQ1: Stress

Research question 1 asked if there were differences in faculty perceptions of stress based upon gender, discipline, and institution type. While all three covariates effected faculty stress, gender had the greatest effect on faculty stress. Women faculty had higher stress levels in all four factors of faculty stress. This supports previous studies in finding that women faculty are more stressed than men (Blix et al., 1994; Cantao, et al., 2010 Dey, 1994; Hagedorn & Sax, 2003; Johnsrud & Rosser, 2002). Disciplinary differences were also exhibited in faculty stress. STEM faculty were less stressed about work but were more stressed than non-STEM faculty in regards to home and students indicating STEM faculty may have more difficulty in balancing work and home. This finding supports Gmelch and colleagues (1986) who found generally STEM disciplines were less stressed in regards to work and students, but they did not examine stressors external to the work environment (i.e., home stress) as was done in this study.

Women in STEM were more stressed in regards to home and promotion, but they were less stressed about students. This supports Rosser's (2004) finding that the balance between work and family was the biggest challenge facing women scientists. It was

interesting to see women in STEM exhibit decreased student stress, as both gender and discipline individually resulted in increased stress with students. While previous research has suggested women faculty may value teaching more than men and therefore may see their interactions with students through a different lens (Canizares et al., 2009; Barbezat, 1991), this study indicates there are disciplinary differences in this perception as well. Women in STEM disciplines may have a greater expectation of working with students, even underprepared students, and as a result are less stressed with these interactions. It is possible these faculty view students as a greater part of their faculty role than do men in STEM who are often found placing greater emphasis on the research aspect of their career.

Faculty at colleges (non-research intensive institutions) were more stressed about work, and students, but were less stressed about promotion. This is a similar result to Astin, Korn, and Dey (1991), who found college faculty were more stressed in regards to their teaching load. Because colleges are often smaller than universities, faculty in these institutions often have greater demands placed on their time due to increased role expectations (Rosser, 2004), accounting for their higher levels of work stress. The interactive effects of discipline and institution also illustrated the positive effect on work stress, as a result of being in a STEM discipline, offsets the increased level of work stress in college faculty as STEM faculty in colleges exhibited lower levels of stress due to work. These faculty also had reduced levels of stress related to promotion but higher levels of stress related to students.

One would expect if women faculty are self-selecting colleges as previously indicated in the literature (Trower & Chait, 2002; Scheinder, 2000), then they would

exhibit less stress in this environment. While the 2013 HERI Faculty Survey sample data illustrated women were more likely to be in colleges (see Table 9), the results of this analysis do not necessarily support the assumption they have selected these institutions for a lower stress work environment as women in colleges were more stressed in three out of four faculty stress factors. Instead, these results support Rosser's (2004) claim women in these institutions have greater teaching loads, more campus expectations, and lack access to graduate students increasing course preparation which could be contributing to increased stress for these faculty.

This study confirmed Dey's (1994) assertion that faculty groups perceive stress differently and therefore different faculty groups should be examined to better understand how to develop policies and procedures to reduce stress and increase not only faculty retention but also their overall well-being. While studies indicate some stress is beneficial to individuals in their career, high levels of stress impact all levels of wellbeing including physical and mental health (Gmelch, 1993). Better understanding of what causes faculty stress and how different faculty groups perceive stress will allow administrators the ability to better design programs and implement policies to target stress reduction in their faculty. This study indicates administrators need to address increased levels of stress in women faculty.

RQ2: Job Satisfaction

Research question 2 asked if there were differences in faculty perception of job satisfaction based upon gender, discipline, and institution type. Using the methodology established by Dey (1994) for faculty stress on job satisfaction, this analysis found women were less satisfied than men in two out of three factors of job satisfaction: Salary & Benefits, and Teaching supporting previous studies in finding that women faculty are

less satisfied than men (August & Waltman, 2004; Bilimoria et al., 2006; Blackburn & Lawrence, 1995; Bozeman & Gaughan, 2011; Cano & Castillo, 2004; Hagedorn, 1996, 2000; Hagedorn & Sax, 2003; Olsen & Near, 1984; Olsen, et al, 1995; Rosser, 2004; Sabharwal & Corley, 2009; Seifert & Umbach 2008, Settles, et al., 2006; Tack & Patitu, 1992)

The finding women faculty were less satisfied with teaching contradicts the assumption made by some that women prefer teaching more than men (Barbezat, 1991). From the beginning of higher education, women have been segregated into “appropriate disciplines” with education often considered “women’s work” (Thelin, 2004). The result of this assumption is women often end up with higher teaching loads, resulting in less time for research, decreased productivity, and lower rates of tenure and advancement (Bellas & Toukoushian, 1999; Canizares, 2009; Misra et al., 2011; Rosser, 2004). There are many problems with this assumption. First, teaching could be simply her choice; some women faculty do enjoy greater time in the classroom and working with students. Alternatively, some women may not have the wherewithal to decline/negotiate teaching loads in favor of greater time for research and by default get stuck with higher teaching loads. Finally, not everyone enjoys teaching, including not all women faculty. The continued perpetuation of this assumption exacerbates many gender issues in higher education including gender differences in satisfaction. Further research is needed to examine division of labor in higher education to identify whether or not gendered discrepancies in teaching loads are the result of individual preference, gendered disadvantage, and/or discrimination. While not included in this analysis, the examination of disciplinary and gender differences in time allocation would provide greater insight

into why women and women in STEM are less satisfied with this aspect of their faculty role.

STEM faculty were more satisfied with their salary and benefits and relationships, but less satisfied with teaching. Faculty in STEM disciplines often have higher salaries than faculty in non-STEM disciplines, primarily driven by the higher earning potential in the private sector (Beede, et al., 2011; Nettles, et al., 2000). This could explain why STEM faculty were more satisfied with Salary & Benefits in this analysis. The dissatisfaction with Teaching is not surprising as STEM disciplines tend to have greater focus/emphasis on research and less emphasis on teaching. This also illustrates how not only higher education is gendered, but so are STEM disciplines. STEM disciplines have been produced and reproduced in the masculine and as a result remain some of the least accommodating disciplines for women. The nature of STEM disciplines is to advance knowledge for its own sake occasionally with practical implications. To accomplish this goal, greater emphasis is placed on research within a STEM higher education career over teaching. As a result research has greater value within these disciplines than does teaching, and as this study illustrates STEM faculty are less satisfied with the teaching component of their work.

College faculty were less satisfied with their salary & benefits, but were more satisfied with their relationships and teaching. Previous studies have shown faculty at colleges are paid less than university faculty (Nettles, et al., 2000) accounting for the decreased satisfaction with salary and benefits in this analysis. Increased satisfaction with relationships and teaching for college faculty supports previous research suggesting faculty, specifically women faculty, self-select into positions where there is greater

emphasis on teaching and greater collegiality (Trower & Chait, 2002; Schneider, 2000) but does to address the gender distribution between these institution types.

While women were less satisfied with salary and benefits, the combined effect of gender/discipline indicated the increased satisfaction with salary and benefits for STEM faculty outweighed the decreased satisfaction with this factor for women, as women in STEM disciplines exhibited greater satisfaction with salary and benefits. However, women in STEM were less satisfied with their relationships and teaching. Women in STEM had the greatest standardized negative effect on teaching of all groups. Women in STEM were least satisfied with their teaching. It would be interesting to see if this was due to increased teaching loads, increased assignment in lower level courses, or in their freedom to determine course content. Previous studies have indicated women are more likely to teach lower level courses and less likely to teach graduate courses, leading to a reduction in graduate student interaction resulting in a decrease in productivity (Rosser, 2004). This could be a factor contributing to this dissatisfaction for women in STEM and indicates this is an area needing to be further addressed through the examination of time allocations between men and women in STEM.

Being at a non-research intensive institution (college) versus a university also resulted in decreased salary and benefits satisfaction which is not surprising as these institutions are often lower paying (Nettles, et al., 2000). Women at colleges exhibited the combined the negative effect of gender and the negative effect of institution type to result in a significant dissatisfaction with salary and benefits. College faculty including women at colleges and STEM faculty at colleges were more satisfied with their relationships and teaching. While gender did not have a significant effect on relationship

satisfaction, women in colleges were more satisfied with their relationships. This supports the theory women are self-selecting these institutions as a result of their increased collegiality. Even though the individual effect of women on teaching was negative, women at colleges had a significant increase in their satisfaction with teaching. This finding also supports previous research indicating women faculty self-select smaller institutions due to the preference for teaching (Trower & Chait, 2002, Schneider, 2000) but as previously discussed this assumption is problematic.

Overall, RQ 2 supports previous research finding women are less satisfied in most areas of job satisfaction (August & Waltman, 2004; Bozeman & Gaughan, 2011; Blackburn & Lawrence, 1995; Hagedorn, 1996; Olsen, Maple, & Stage, 1995; Seifert & Umbach, 2008; Trower & Chait, 2002). It additionally indicates there are group differences in the perception of job satisfaction based upon gender, discipline, and institution type. It further illustrates how gender and discipline (STEM vs. non-STEM) often have inverse effects on faculty perception of these constructs. As a result of an inverse relationship women in STEM may appear to show no difference in their perception of job satisfaction, and when these covariates are directly related, the impacts for women in STEM become magnified.

RQ3: Intent to Leave

Research question 3 asked if there were differences in faculty perception in intent to leave based upon gender, discipline, and institution type. The analysis of faculty intent to leave supports previous studies finding women are more likely to consider leaving their academic position or academia entirely (Rosser, 2004; Tack & Patitu, 1992). Faculty in STEM disciplines and STEM faculty at colleges were less likely to consider leaving. The combination of gender/discipline was insignificant, likely indicating the

negative effect of gender is offset by the positive effects of being in a STEM discipline. There was, as a result, no evidence to support that women in STEM disciplines are more likely to leave than women in non-STEM disciplines.

RQ4: Relationship between Faculty Stress, Job Satisfaction, and Intent to Leave

The final RQ examined the interaction between faculty stress, job satisfaction, and intent to leave. The initial model illustrated both faculty stress and job satisfaction effect faculty intent to leave, but showed the effect of stress on faculty intent to leave is greater due to the mediating effects of job satisfaction. Although job satisfaction had the greatest overall effect on faculty intent to leave, the direct effects of stress on job satisfaction and the indirect effect of stress on intent should not be ignored.

Gender, discipline, and institution type had significant impacts on this relationship. Consistent with previous sections, gender had the greatest impacts on the model. Women faculty exhibited higher levels of stress supporting the findings of RQ 1 and previous research. The direct effect of gender on job satisfaction was women faculty were actually more satisfied than men contradicting previous research. . However, the effect of this increased satisfaction was cancelled out due to the indirect effect of the higher levels of faculty stress exhibited by this group. While gender did not have a direct effect on faculty intent to leave, women were indirectly more likely to intend to leave due as the result of their increased faculty stress reducing job satisfaction.

Women in STEM disciplines did not exhibit significant differences in faculty stress. The one-way effects of gender and discipline were inverse of one another and this is likely the result of the insignificance of this result indicating the positive effect of discipline on stress buffers the negative effect of gender. Even though the effects of

gender and discipline individually increased levels of satisfaction directly, the combined effect of gender and discipline resulted in a decreased, direct negative effect on job satisfaction (i.e., women in STEM are less satisfied). Even in the absence of increased stress, this dissatisfaction then resulted in a significant, and indirect increase in faculty intent to leave. While the effects were small, this analysis supports previous research indicating women in STEM have higher attrition rates (Callister, 2006; Ceci, et al., 2009; Rosser, 2004; Silander, Haake, & Lindberg, 2013; Trower & Chait, 2002; Walters & McNeely, 2010) in finding that women in STEM showed increased intent to leave.

If women are self-selecting non-research intensive (college) environments for their greater collegiality and teaching preferences as suggested (Trower & Chait, 2002; Scheinder, 2000), then the expected outcome of this analysis would have been to find women in these positions to be less stressed and more satisfied. The results of this study indicate the opposite. Women in colleges had a significant and negative effect on faculty stress. Following the pattern established by gender, and institution individually, women in colleges had a direct effect of increased job satisfaction, but their increased levels of stress resulted in the indirect effect of decreasing satisfaction and increasing intent to leave. Women in colleges having increased intent to leave in this study does not support studies suggesting women are self-selecting these institutions. Rather, these findings support studies (Rosser, 2004) suggesting women in these institutions are less satisfied and have higher levels of stress. It would therefore appear there are other contributing factors to the continued concentration of women faculty in these non-research intensive institutions.

Expectancy theory holds faculty should be motivated to stay in their positions if they feel the effort they put into their work will result in the necessary performance to achieve their rewards (Vroom, 1964). This study illustrates differences in faculty motivation exist based upon faculty group differences. For women faculty, including women faculty in STEM, increased stress related to promotion impacts their motivation to remain in their position through decreasing their instrumentality. That is to say, women and women in STEM both exhibited increased stress due to the review/promotion process and their job security, and if this stress is the result of perceived inequality in this process and their resulting job insecurity, then their instrumentality will be reduced resulting in reduced motivation explaining the increased intent to leave illustrated for both of these groups in the study. This is further supported by gender differences in job satisfaction, specifically with salary and benefits. Women were less satisfied with this factor of job satisfaction than men. If this dissatisfaction is rooted in salary inequality (i.e., the continued existence of gender wage gaps) perceived or actual, then instrumentality for women is further reduced, further reducing motivation and increasing their intent to leave.

This dissatisfaction with salary and benefits not only impacts faculty instrumentality reducing their motivation to remain in their positions, but also impacts women's valence (desire for a particular reward). Inequity in salary contributes to a reduction in the desire for the reward as women feel they are working as hard or harder to achieve a lesser reward. This reduction in valence results in decreased motivation and ultimately results in increased intent to leave. Valence for women, including women in STEM, is further reduced by stress as a result of conflicts in work-life balance. Women,

and women in STEM, had higher levels of stress related to their home responsibilities. This includes stress related to managing household responsibilities, child care, and lack of personal time. While marital and parental status were not examined in this study, the study indicates women have higher perceptions of stress related to their marital and parental status than do men. This results in greater work-life conflict and reduces their valence for their work ultimately resulting in an increased intent to leave their position.

While ET is commonly used to frame studies of faculty intent to leave, including this study, it is not the only framework to consider. The examination of gender differences in any faculty construct in higher education needs to consider Acker's theory of gendered organizations. Acker's theory defines a gendered organization as any organization having "advantage and disadvantage, exploitation and control, action and emotion, and meaning and identity... patterned through and in terms of a distinction between male and female, masculine and feminine" (1990, p.146). Acker argues historical organizational theories, such as ET, claim they hold a gender neutral viewpoint, but in reality this gender neutral viewpoint has actually been standardized in the masculine. Higher education was established by and has been perpetuated in the masculine ideal of the "universal worker", an individual who has no responsibilities outside of the workplace, and who is wholly dedicated to their job, and/or discipline. This concept, even while claiming to be gender neutral, is male-biased, as traditionally only men are capable of fulfilling this role due to the traditionally held, stereotypical beliefs women are primary caretakers of home and family which distracts them from the demands of their job and/or discipline and as a result they are viewed as incapable of becoming this "universal worker". As Acker stated "the concept of the universal worker

excludes and marginalizes women who cannot... achieve [these] qualities because to do so is to become like a man” (1990, p. 150). Therefore, while Expectancy theory is commonly used to address workplace motivation, it inadequately addresses differences in motivation due to gender as well as the impact of gendered organizations on its components.

It is only when higher education institutions begin to address and value, truly value, the differences in the experiences and expectations between men and women within and across discipline and institution types, we will begin to break down the gendered nature of the academy. Only then will we begin to un-gender higher education enabling the creation of an environment where all faculty not only survive, but thrive.

Implications

Overall this analysis illustrates women, including women in STEM disciplines, continue to exhibit higher levels of faculty stress reducing their job satisfaction, resulting in increased intent to leave either their institution or academia overall. Even when results indicated women are more satisfied, the negative effects of their increased stress outweighed the increases in satisfaction, and, resulted in increased intent to leave.

Although studies have shown biologically there are no differences between genders in ability when it comes to training in a STEM discipline (Ceci, Williams, & Barnett, 2009), the demands and culture of STEM may result in women faculty finding this choice of career incompatible with their goals in their personal life (i.e., work-home balance). Some authors have suggested STEM careers are less accommodating to individuals desiring to raise a family (Beede et. al., 2011), others have indicated ultimately it is either free choice or constrained preference that determine women’s participation in these disciplines (Ceci, Williams, & Barnett, 2009). If institutions want to

increase the diversity in STEM faculty to include a greater representation of women, institutions will have to do more to address work-home balance. This will need to include the development and greater acceptance of policies designed to address work-home balance, including but not limited to: family-friendly policies, stop-the-clock tenure policies, greater access to high-quality childcare, and more dual-career hires (Rosser, 2004). By ensuring these, and/or similar policies, are available, along with provisions ensuring that there is no discrimination in the utilization of them, institutions will be better able to help faculty achieve work-home balance and reduce faculty stress.

Reduction of faculty stress for women faculty is also critical to increase their retention. A major contributor to faculty stress in this study was the lack of personal time. The last decade has seen major advances in technology providing faculty the ability to remain connected to their work at all times (e.g., smart phones, tablets, Wi-Fi, online document access). While in some regards this technology has made faculty lives easier (e.g., no longer are the days faculty have to go to campus to enter/drop off grades), and potentially even more flexible than ever (e.g., ability to answer emails from almost anywhere), it has created the expectation faculty are always accessible and able to respond to work when not “at work.” Belkin, Becker, and Conroy (2016) found the inability to disengage from work as a result of inability to disconnect from email and other electronic tasks, results in chronic stress and emotional exhaustion in employees. The authors further stated it is not only the ability to always be connected to work that results in increased stress, it is their sense there is an organizational expectation to always be accessible creating additional stress. For faculty this means they are now less able to separate work from home, as work can now be performed at home with little

inconvenience, except for the inconvenience of their time. As a result, faculty now have even less personal time and exhibit increased stress. Institutions and their administrators need to do a better job addressing their organizational expectations in regards to after-hours emails. Policies encouraging greater segmentation (i.e., separation of work and home tasks) have the potential to reduce stress related to home which can ultimately increase faculty job satisfaction and reduce faculty intent to leave.

Another factor contributing to increased stress and decreased satisfaction for women faculty is time allocation. While this study did not examine differences in time allocation, previous studies have also shown women faculty spend greater time in service activities such as committee work, advising, and mentoring (Bellas & Toutkoushian; Guarino & Borden, 2017; Rosser, 2004; Russell, et al., 1991), and teaching (Bellas & Toutkoushian, 1999; Rosser, 2004), while men spend more time on research (Bellas & Toutkoushian, 1999). The impact of this discrepancy in time allocation between genders is women ultimately spend less time in research and as a result show decreased faculty productivity (Rosser 2004). This could be a factor contributing to increased work stress and decreased teaching satisfaction for women faculty in this study.

Even though this study indicates women in STEM are more satisfied with their salary and benefits, salary differences were not examined, and recent studies of national data sets have found men in STEM disciplines had a 30% earning advantage over women in STEM disciplines, resulting in a 22.5% earning gap (Xu, 2015). Xu also found married women in STEM were even more disadvantaged, and concluded it appeared employers (not only employers in academia) appeared to be reluctant to offer competitive salaries to women in their childbearing years indicating the continued presence of gender bias

within STEM salaries. The presence of a large gender wage gap contributes to the attrition of women from STEM positions as it likely results in a reduction in the valence of their rewards if they feel they are being paid less to do the same work. Institutions and administrators need to evaluate pay inequity within all disciplines, but especially need to be aware of this inequity in disciplines where women continue to be the minority, such as STEM. Further, if institutions truly want to not only attract, but additionally, retain women in these positions, institutions need to address their continued expectation of the universal worker, and develop a culture of respect for the impact human biology has on the careers of women.

Many studies of gender and STEM often use a pipeline metaphor to illustrate the loss of women from various points in the pipeline from selection of high school course work to undergraduate major selection and completion, to graduate school major selection and completion, and finally, though lesser studied, selection of a faculty position. Previous studies have shown gender match mentoring to positively impact the progression of women through the pipeline (Carrigan, Quinn & Riskin, 2011; Ragins & Sandura, 1994; Trower & Chait, 2002). Increasing the retention of women faculty in general, but especially in STEM disciplines, therefore, has the potential to impact several key points in the metaphorical STEM pipeline. By increasing the numbers of women faculty available to act as role models and mentors for undergraduate and graduate women students we will increase the flow of women through this pipeline. However, if the women serving as role models are stressed out and dissatisfied with their work, not only are they going to be more likely to leave their position, but those looking up to them are going to be less likely to follow in their footsteps. It is also important for women

faculty mentors to, as O’Meara, Bennet, and Niehaus state “leave less unsaid” when it comes to mentoring future faculty (2016, p. 291). Clearly defining the nature of faculty work and helping young faculty develop reasonable expectations for their future career will help to reduce faculty loss due to unmet expectations. Overall, less stressed and higher satisfied women faculty are key in the mentoring and advisement of the next generation of women faculty.

While intent to leave is often utilized as a proxy for actual leaving behavior, and in this study was the only data available to measure faculty attrition, some authors suggest many more faculty intend to leave than actually leave (Daly & Dee, 2006; Rosser & Townsend, 2006; Zhou & Volkwein, 2004). Leaving behaviors are often categorized into push and pull factors (O’Meara, Bennett, & Niehaus, 2016). Pull factors are conditions pulling an individual from the institution such as higher salary or increased prestige of an institution, while push factors are conditions causing faculty to look for opportunities at other institutions such as dissatisfaction. This study focused on these push factors finding dissatisfaction increases intent to leave an institution. This study cannot address faculty leaving higher education for better opportunities due to the nature of the data utilized, but it is important to consider women faculty in STEM may be leaving their academic positions for reasons other than their higher stress and lower satisfaction. STEM trained individuals are highly employable in the private sector and may offer opportunities for women faculty to work in lower stress more satisfying environments where they are better able to achieve desirable work-life balance. Studies similar to O’Meara, Bennett, and Niehaus (2016) qualitative analysis of faculty actually leaving a research intensive institution focusing on STEM faculty departures would

further contribute to our understanding of why women faculty are leaving STEM at higher rates.

Future Research

Future studies may build on this research through the examination of other faculty groups. Gender, discipline, and institution type represent only one set of a myriad of possibilities that could be used to examine faculty group differences. Race, tenure status, rank, and salary could also have served as covariates in this or future analyses. This study also leaves open questions regarding the continued concentration of women in non-research intensive institutions. Further research exploring whether this is the result of free choice or discriminatory hiring practices is warranted to address these questions. Finally, while this study is quantitative in its design, further qualitative analysis would bring additional insight into the results of this study. It is through the voices of women scientists discussing the challenges they face and have faced in their educational and professional careers that we will better understand the quantitative results of this study. In this age of greater awareness of sexual harassment and gender inequality through hashtag movements (e.g., #metoo and #timeisup), it is time to hear their stories.

Conclusion

This study examined the factors influencing the retention of women faculty in STEM disciplines using the 2013 HERI Faculty Survey. Results supported previous research in finding that women faculty have higher levels of stress, are less satisfied, and were more likely to have intent to leave their institutions or academia entirely. Additionally, this study contradicts previous studies suggesting women self-select into non-research intensive institutions due to their assumed preference for teaching in finding women in non-research intensive institutions were more stressed and ultimately more

likely to have intent to leave. Women in STEM disciplines had higher levels of stress related to home and promotion. While these faculty were more satisfied with their salary and benefits as a result of disciplinary effects, they were less satisfied with their relationships and teaching. Overall, women in STEM were shown to have a greater intent to leave their institution or academia as a result of their decreased satisfaction. This study indicates women in STEM are more likely to leave their position or academia as a result of increased stress and decreased satisfaction. Administrators in higher education will need to further examine their practices and policies regarding work-life balance in an effort to decrease faculty stress and increase satisfaction for this faculty group in order to increase retention of women faculty in STEM disciplines.

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APPENDIX

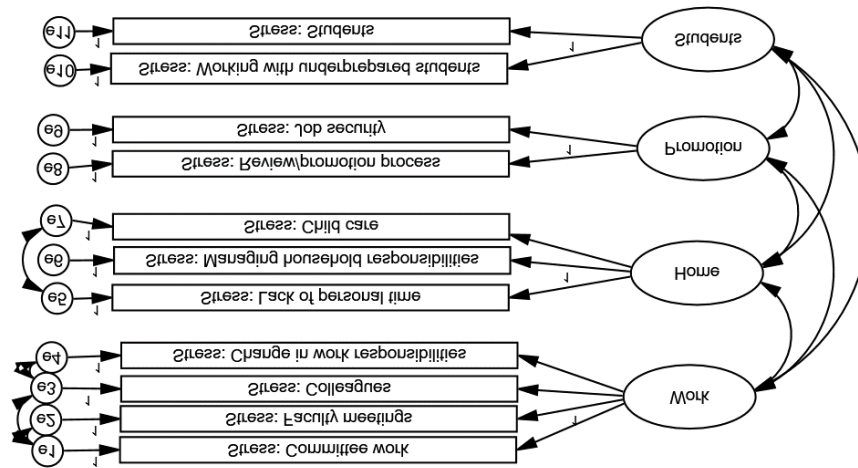


Figure A1. CFA model illustrating four factors of Faculty Stress for the 2014 HERI Faculty Survey.

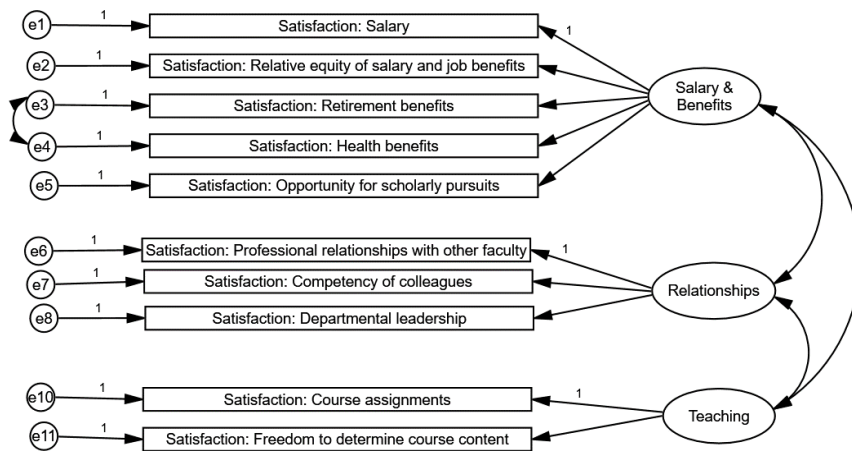


Figure A2. Final CFA model for Job Satisfaction

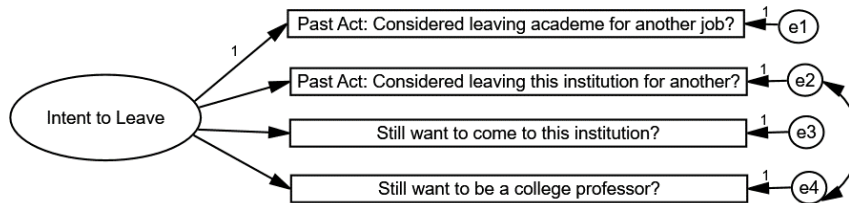


Figure A3. CFA model for the four items related to Faculty Intent to Leave in the 2013 HERI Faculty Survey

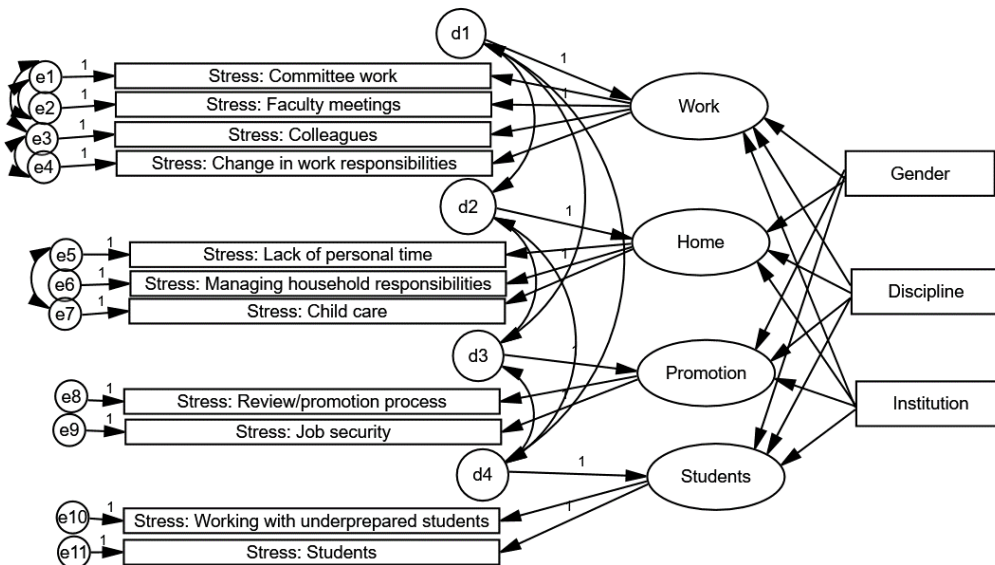


Figure A4. MIMIC model #1 for Faculty Stress examining influence of gender, discipline, and institution type on four factors of Stress using 2013 HERI Faculty Survey data.

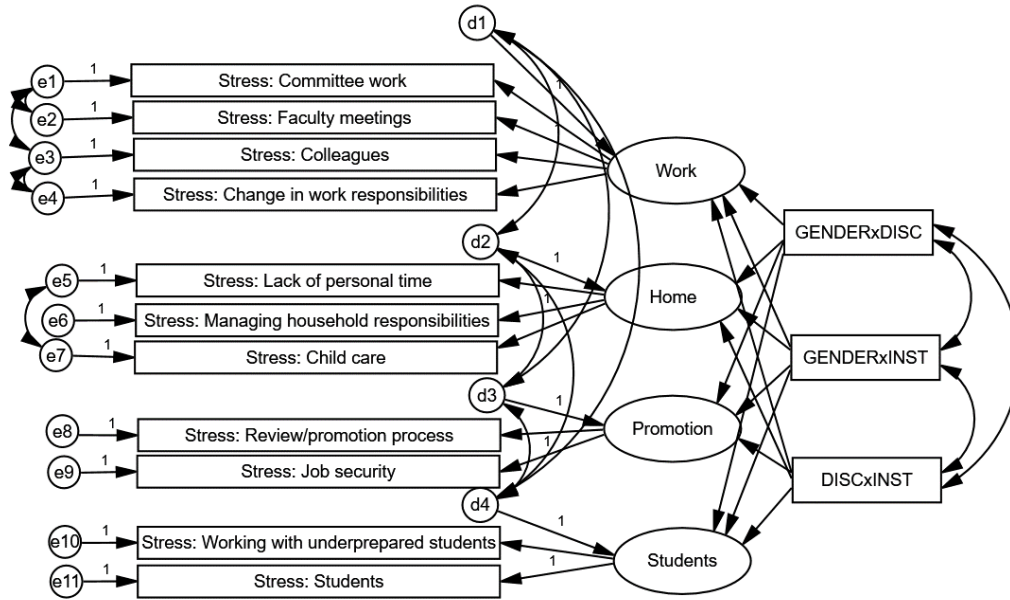


Figure A5. MIMIC model #2 illustrating the effects of the two-way interactions of Gender, Discipline, and Institution on the four factors of Faculty Stress.

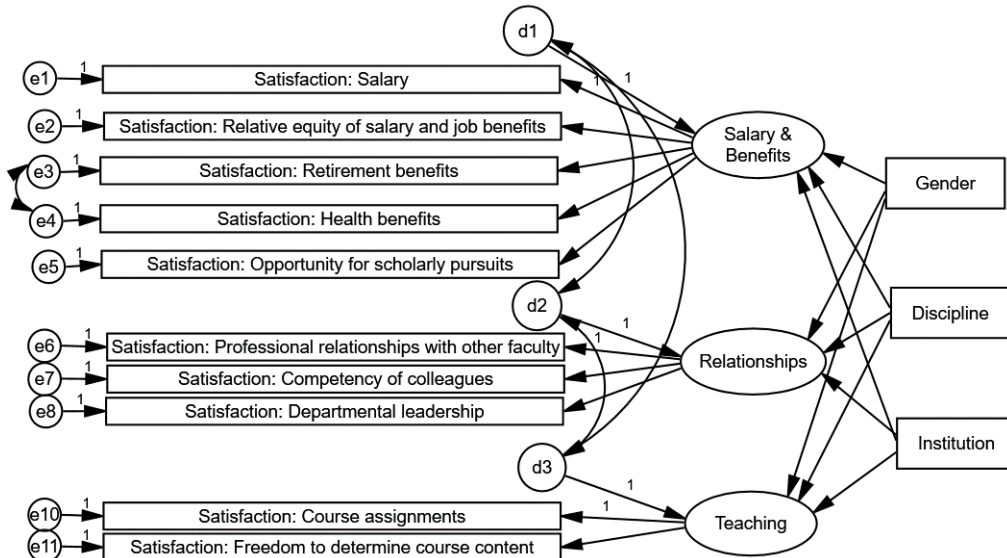


Figure A6. MIMIC model #1 illustrating the effects of Gender, Discipline, and Institution on the three factors of Job Satisfaction.

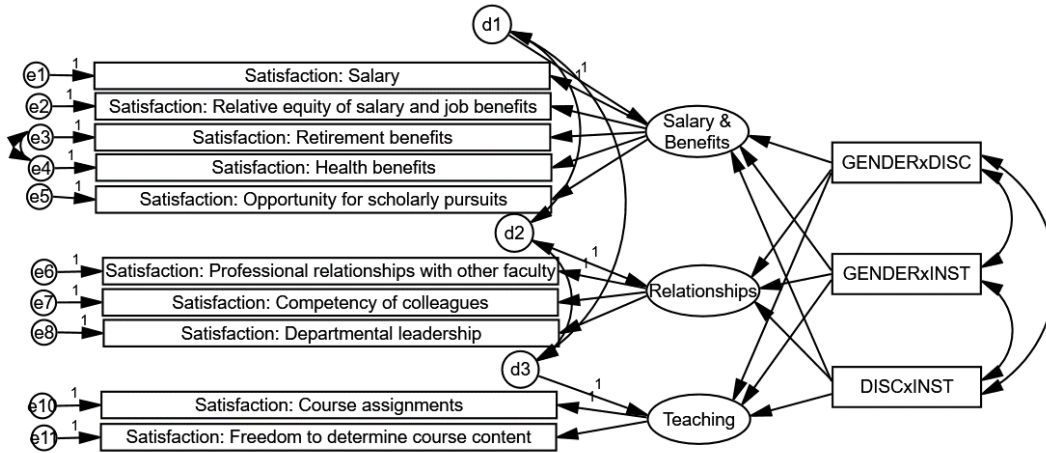


Figure A7. Job Satisfaction MIMIC model #2 illustrating the effects of the two-way interactions of Gender, Discipline, and Institution on the three factors of Job Satisfaction.

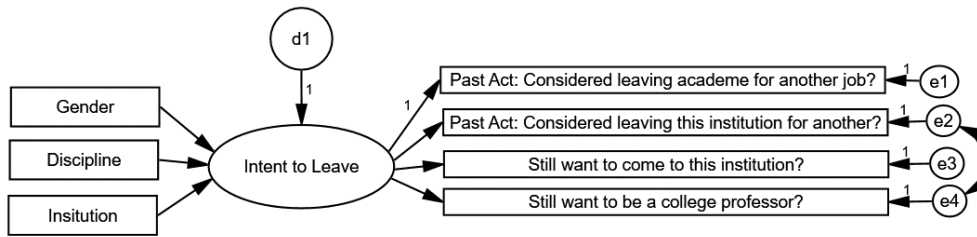


Figure A8. MIMIC model the effects of gender, discipline, and institution on Intent to leave

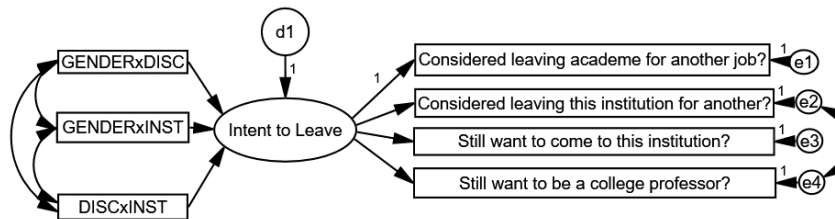


Figure A9. MIMIC model the effects of two-way interactions of gender, discipline, and institution on Intent to leave

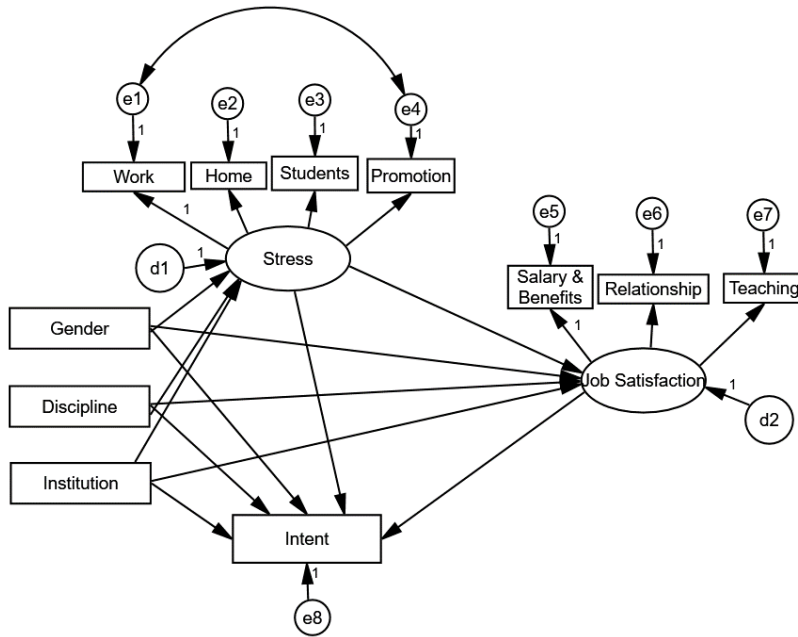


Figure A10. Hybrid MIMIC SEM model of Stress, Job Satisfaction, and Intent to leave with interactive effects of Gender, Discipline, and Institution.

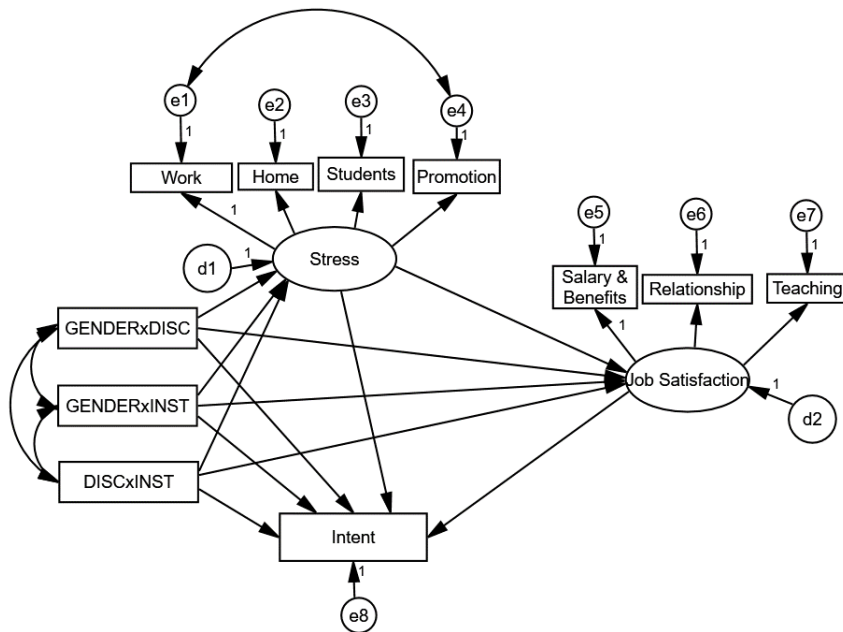


Figure A11. Two-way interaction of Gender, Discipline, and Institution on SEM of Faculty Stress, Job Satisfaction, and Intent to leave.

CURRICULUM VITAE

Carrie J. Christensen, M.S., PhD

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EDUCATION

University of Louisville, Louisville, KY
Ph.D. Educational Leadership & Organizational Development 2018
• Completed additional 26 hours in graduate biology coursework in 2005

Tennessee Technological University, Cookeville, TN
M.S. Biology 2002

Centre College, Danville, KY
B.S. Biology 1999

ADMINISTRATIVE EXPERIENCE

Academic Dean, St. Catharine College 2014- 2016

HIGHER EDUCATION TEACHING EXPERIENCE

St. Catharine College 2010-2016

Assistant Professor, Department of Natural Sciences

Bellarmino University 2016- current

Adjunct faculty

Spalding University 2016- current

Adjunct Faculty

Jefferson Community & Technical College 2005-2010

Full time Faculty

Adjunct Instructor Indiana University Southeast 2004

Adjunct Instructor Volunteer State Community College 2000-2002

Adjunct Instructor Tennessee Technological University 2000

Graduate Assistant 2000-2002

Tennessee Technological University, Cookeville, TN

Teaching Assistant 2002-2003

University of Louisville, Louisville, KY

Research Assistant 2003-2004

University of Louisville, Louisville, KY

PUBLICATIONS

- Christensen, C., (2018). Factors influencing the retention of women faculty in STEM. Dissertation, University of Louisville, Louisville, KY.
- Dugatkin, L.A., McCall, M., Gregg, R., Cavanaugh, A., Christensen, C. & Unseld, M. (2004). Individual differences in risk-taking behaviour during predator inspection in zebrafish (*Danio rerio*). *Ethology, Ecology and Evolution* 116:e1-e5
- Christensen, C.J. (2004). Social biology in two flocks of giant Canada geese in Tennessee, In: Proceedings of the 2003 International Canada Goose Symposium, Madison, Wisconsin.
- Christensen, C. (2002). Aggression and Dominance in a flock of giant Canada geese in the Upper Cumberland region, Tennessee. Master's Thesis, Tennessee Technological University, Cookeville, TN.

PRESENTATIONS

- Christensen, C., Burton, J., & Gnadinger, C. (2016, May). *What does compliance have to do with me?: Talking with faculty about regulatory compliance*. International Conference on Learning and Administration in Higher Education. Nashville, TN.
- Christensen, C. (2016, April). *Professional Development Seminar: Using Advocate for Reporting Academic Dishonesty*, St. Catharine College
- Christensen, C. (2016, March). *Women's History month: A historical perspective of the examination of gender wage gaps in higher education: Where do we go from here?* St. Catharine College.
- Christensen, C. (2016, February). *Professional Development Seminar: Synchronous online Instruction*. St. Catharine College.
- Christensen, C. & Osborne, E. (2015, September). *Advising 101: The nuts & bolts*. St. Catharine College.
- Christensen, C. (2015, August). *Faculty Orientation 101*. St. Catharine College.
- Christensen, C. & Osborne, E. (2015, March). *Advising 101: Pre-registration of incoming students*. St. Catharine College.
- Christensen, C. & Inge, B. (2014). Effects of Gender and Degree Expectation on Constructs of Math Achievement. University of Louisville Spring Research Symposium.

AWARDS & RECOGNITIONS

- SACSCOC Travel Grant Award Recipient 2016
- Excellence in Presentation Award, International Conference on Learning and Administration in Higher Education. Nashville, TN. May 26th 2016
- Nominated for SCC Faculty Member of the Year 2012-2013
- Metroversity Outstanding Faculty Member of Adult Learners, JCTC –Nominee 2008
- Metroversity Outstanding Faculty Member of Adult Learners, JCTC –Nominee 2009

PROFESSIONAL DEVELOPMENT & TRAINING

- Kentucky ACE Women’s Network in Higher Education. Moving the Needles: Advancing Women in Higher Education Leadership, Georgetown College, June 3rd 2016
- National Alliance of Concurrent Enrollment Partnerships, Kentucky Dual Credit Summit, April 2016
- “Drafting a Title IX Compliant Sexual Misconduct Policy.” Workshop presented by AIKCU & Jim Newberry, Georgetown College, April 16th 2015.

SERVICE TO THE COLLEGE

- Provost Council, 2014-2016
- Academic Affairs Council, 2014-2016
- Executive Committee of Faculty Government, Faculty Government Secretary 2011-2014
- SPARC (Strategic Planning Assessment Review Committee), 2014-2016

College Committee Membership

- SACS 10-year Reaffirmation Writing Committee, 2016
- College Catalog Committee, 2014-2016
- Administrative Representative on Committee on Curricular Development, 2014-2016
- SACS Fifth Year Referral Report Writing Committee, Spring 2015
- Graduation rate analysis committee, 2016
- Safety & Security Committee, 2010-2016
- Chemical Hygiene Officer 2010-2014
- Admission Appeals Committee, 2014-2016
- Student Housing Appeals Committee, 2016
- Spring Awards Committee, 2015, 2016

- Graduation Planning Committee 2015, 2016

College Search Committee Service

Chair:

- Athletic Director Search Committee, Spring 2016
- Department Chair of Health & Human Sciences & Program Director of Athletic Training Search Committee, Summer 2015
- Department Chair of Nursing Search Committee, Summer 2015
- Program Director of Surgical Technology Search Committee, Summer 2015
- Assistant Professor & Clinical Coordinator of Athletic Training search Committee, Search Committee, Summer 2015
- Assistant Professor Business & Management Search Committee, Summer 2015
- Assistant Professor of Criminal Justice Search Committee, Summer 2015
- Assistant Professor of Education Search Committee, Summer 2015
- Clinical Coordinator of Diagnostic Sonography Search Committee, Summer 2015

Member:

- Provost Search Committee, Spring 2015
- VPAA Search Committee Spring 2014
- Assistant Professor of Farming & Ecological Agrarianism Search Committee, Spring 2014
- Assistant Professor of Farming & Ecological Agrarianism Search Committee, Summer 2013
- Program Director of Nursing Search Committee, Summer 2013
- Nursing Faculty Search Committee, Summer 2013
- Nursing Faculty Search Committee, Summer 2013
- Assistant Professor of Biology Search Committee, Summer 2012

SERVICE TO THE PROFESSION

- Kentucky ACE Women in Higher Education Network, Institutional Representative, 2015-2016
- Content Editor for the Biology section of Barron's 2015 MCAT Review, 2013-2014.

SERVICE TO THE COMMUNITY

- Founding member of Alex R. Kennedy PTA, Treasurer, 2015-2016, 2016-2017, 2017-2018.
- School Based Decision Making Council (SBDM) parent representative, Alex R. Kennedy Elementary School, 2015-2017, 2017-2019.
- Troop Leader, Girl Scout Troop #737