Job Satisfaction Factors Influencing Mentorship of Faculty in Academia

by

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ABSTRACT

Faculty have the role of educators, researchers, community service advocates, and mentors to name a few. The recruitment and promotion of a diverse faculty is critical for higher education. Mentoring has been identified as a significant element in addressing the underrepresentation of women and minorities (Kosoko-Lasaki, Sonnino, & Voytko, 2006). Bilimoria et al (2006) showed that there is a significant difference by gender on effective institutional leadership, institutional mentoring, internal relational support and academic job satisfaction. Using data from "The Collaborative on Academic Careers in Higher Education" (COACHE) 2011 survey, this study focuses on faculty job satisfaction/fulfillment, job importance and mentoring. This study provides a window to faculty's job satisfaction/fulfillment and the importance of these factors, as it is distributed by gender and discipline. The study looks at the act of faculty mentoring of younger faculty and provides data on factors influencing the mentoring activity by type of discipline and faculty status.

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CHAPTER 1: INTRODUCTION

In the last two decades, universities and colleges throughout the United States have seen dynamic changes for students, faculty and administrators. The economy, jobs, politics, research, outreach, teaching and competition drive the changes in student, faculty and administrative roles in institutions in US higher education. Despite many current changes, the United States (U.S.) occupies a leading role in education both nationally and internationally. Historically, the U.S. is an economic powerhouse. Maintaining such a status in this era, the U.S. depends on training on certain job skills particularly those in Science, Technology, Engineering and Mathematics (STEM). STEM skills are a necessary ingredient to maintain a competitive stance in the world (National Science Board, 2008).

Consequently, the need to increase recruitment and retention of students and faculty in STEM has been the topic of many conferences, state and federal studies. There is a tremendous movement to increase the number of degrees and careers in STEM fields in the U.S. It is projected that there will be "1 million more STEM professionals,' needed in the next 10 years (Chen, 2013). Approximately 48% of bachelor's degree and 69% of associate's degree STEM seeking students left in spring 2009 after entering postsecondary education in 2003 to 2009 (Chen, 2013). Issues of decreasing student enrollment, retention and graduation are of great concern to administrators on a daily basis (Griffith, 2010). Administrators have the unique task of working towards the social

relevance of an institution specifically among students and faculty. This can easily be seen in the work of presidents, provosts, deans, chairs, directors, financial and human resource officers. For example, they are particularly vested to increase retention and graduation rates in STEM fields through recruitment, bridge programs, mentoring to name a few.

Faculty play a fundamental part of student's development, job training and in particularly retention. On the faculty's part, Lau (2003) discusses the need for the use of technology, hands-on computer experience, emphasis on teaching and learning, cooperative learning, collaborative learning and academic advising for enhancement of student retention. Faculty are generally adaptive and change as their environment asks of them. Faculty are the essential link for recruiting, retaining and training the new generation of STEM students and new faculty. Likewise, what they do and how they assist younger faculty with their professional progress is also a matter of great concern to universities. Mentoring of new faculty is critical for the well-being of the institution (Luna & Cullen, 1995). Thus, faculty retention is an important and integral part of the equation in higher education.

This study explores the trends in faculty composition by rank and gender. It also provides a window to faculty's job satisfaction/fulfillment and importance of these factors upon their work with younger faculty, as it is distributed by gender and discipline (STEM vs. Non-STEM). Finally, the study focuses on the act of mentoring and provides data on factors influencing the mentoring activity by type of discipline (STEM vs. Non-STEM).

Background for the Study

In order for the United States to continue to be an economic power and leader in the world, it needs to nourish, expand and train its next generations of students, graduates and citizens. In particular, the need for increasing and training the next generation is also critical to the country's sustainability and development. National Science Foundation's (NSF) definition of the fields pertaining to STEM include mathematics, natural sciences, engineering, computer and information sciences, and the social and behavioral sciences – psychology, economics, sociology, and political science (Bray, 2010; National Science Foundation, Division of Science Resources Statistics, 2009). The definition of STEM can differ by organizations and institutions.

Student retention in STEM is a troubling trend across institutions in the U.S. A high percentage of students who enroll in STEM programs drop or switch to Non-STEM disciplines. The U.S. Department of Education reported "48 percent of bachelor's degree students and 69 percent of associate's degree students who entered STEM fields between 2003 and 2009 had left these fields by Spring 2009" (Chen, 2013). To add to these statistics, the underrepresentation of women and minorities in STEM postsecondary fields and at the faculty level particularly in the hard sciences is troubling.

Enrollment in postsecondary education has generally increased in numbers in the past two decades, but retention and graduation rates have fluctuated. Retention is a complex issue and is critical in academia (Lau, 2003). According to the National Science Foundation (NSF), particularly data coming from the National Center for Science and Engineering (NCSES) shows that the number of Bachelor's, Master's and Doctorate degrees have steadily increased since 1966. Of those awarded bachelor's degrees in 2010,

Science and Engineering (S&E) degrees were approximately 31.5%. Women earn 57% of all Bachelor's degrees, yet they earned only 50.3% of all S&E Bachelor's degrees in 2010. (National Science Foundation, www.nsf.gov/statistics/2015/nsf15326/pdf/nsf15326.pdf).

At the Master's level, there were a total of 421,358 degrees awarded to women accounting to 60.3% of all Master's degrees awarded in 2010. This is a significant jump since 1966 when women earned only 33.8% of all Master's degrees. Science & Engineering degrees only accounted to 20% of all Master's degrees. Although this is a small percentage, 45.5% or 63,660 Master's S&E degrees were earned by women. Within Science and Engineering Men and women differ by type of field they choose to major in (National Science Foundation, www.nsf.gov/statistics/2015/nsf15326/pdf/nsf15326.pdf).

Women earned 40.9% of all S&E degrees in 2010. Women had higher representation in biological and agricultural sciences whereas men had the highest representation in Engineering. There were a total of 48,053 doctorate degrees awarded in 2010. Women earned 46.8% (22,505) of the total number of doctorate degrees. Science & Engineering had the highest representation at this level. S&E accounted to 69% of all doctorate degrees. At this degree level, there are more students graduating in S&E than at the Bachelor's and Master's level by a high margin. As the academic level of degrees increases, the percentage of earned degrees in S&E increases, and the percentage of women in S&E decreases (National Science Foundation, www.nsf.gov/statistics/2015/nsf15326/pdf/nsf15326.pdf).

As the number of students in academia has significantly increased since 1966 so has the number of students in STEM. The US economy will need 54.8 million jobs in 2020 (Carnevale, Smith & Strohl, 2013). It will need to fill 24 million new jobs plus 30.8 million jobs from retirees. This forecast also shows that about 65% of job seekers will need postsecondary education. In terms of STEM jobs, there will be a need of 1.5 million new jobs and 1.09 million replacement jobs, for a total of 2.64 million (Carnevale, Smith & Strohl, 2013). It is also projected that there will not be enough qualified people to fill the job openings in STEM.

Despite the need to increase the number of students in STEM in postsecondary education, the underrepresentation of women and minorities in this area is critically low particularly in the hard sciences. The number of women entering higher education has significantly increased, but their representation at the higher tiers (e.g. Assistant Professor, Associate Professor, Full Professor, dean, chair, provost, etc.) in higher education continues to be significantly underrepresented. STEM women-faculty are much less represented in the hard sciences and in administration than in other areas. Mentoring has been identified as a significant positive practice to address issues of underrepresentation of women and minorities (Kosoko-Lasaki, Sonnino, & Voytko, 2006)

Research also shows that those intending to become faculty in STEM should have multiple mentors from different areas before they become faculty. A mentor is defined as someone, who is usually older and more experienced, investing time and energy for the advancement of the protégé's career or goal (Collins, 1983; Wickman, 1997). Van Eck Peluchette and Jeanquart (2000) have suggested that having multiple mentors inside and

outside academia significantly do better than those "without mentors" and those with mentors "only outside of the work place".

Bilimoria et al (2006) showed that there is a significant difference by gender on effective institutional leadership, institutional mentoring, internal relational support and academic job satisfaction. Bilimoria et al (2006) study also showed that institutional mentoring is highly correlated to internal relational support, academic job satisfaction, achieved academic rank, and gender. The research suggested that there was a significant association between internal academic resources and internal relational supports for women; and effective institutional leadership and institutional mentoring for men.

Statement of the Problem

Science, Technology, Engineering, and Mathematics faculty play a critical role in retaining and graduating undergraduate and graduate students in these disciplines. Indirectly, the need for recruiting and retaining STEM (Science, Technology, Engineering, and Mathematics) faculty is of importance to the development and stability of the United States. Mentoring is a vital component for assisting faculty to successfully navigate academia. Thus this dissertation research focuses on 49 institutions in higher education and elaborates on job satisfaction/fulfillment, job importance and mentoring of faculty by gender and discipline (STEM vs. Non-STEM). The study further investigates job satisfaction factors associated with mentoring by type of discipline for both tenured and on tenure-track faculty. Therefore this study will assist administrators, faculty and students with implementing necessary adjustments and policy changes to assist with mentoring of STEM faculty and in so doing, assist with their recruiting and promotion in academia.

Purpose of Study

The purpose of this study was to examine faculty's job satisfaction/fulfillment, job importance and mentoring by gender and type of discipline (STEM vs. Non-STEM) using the 2011 Collaborative on Academic Careers in Higher Education (COACHE) survey. "(COACHE) is a Harvard-based consortium of institutional leaders who are taking cost-effective steps to improve outcomes in faculty recruitment, development, and retention." (http://sites.gse.harvard.edu/coache) This discussion section adds to a growing body of literature on recruitment and retention of faculty in STEM particularly the differences these faculty encounter in job satisfaction/fulfillment and mentoring to Non-STEM faculty. This study also examined job satisfaction factors influencing faculty being mentored and those mentoring in STEM and Non-STEM fields.

Research Questions

1.) To what extent is there a difference between STEM and Non-STEM faculty members in terms of job satisfaction/fulfillment, occupational importance and mentoring?

2.) What is the relationship of gender to job satisfaction/fulfillment, job importance, and mentoring and STEM & Non-STEM academic mentors?

3.) What job satisfaction/fulfillment factors relate to the importance of a pre-tenured faculty succeeding as a faculty member (STEM vs. Non-STEM)?

4.) What job satisfaction/fulfillment factors relate to the likelihood that tenured faculty mentor in their department?

Significance of the Study

Faculty throughout the United States are as an instrumental force in educating and preparing the next generation of students and citizens. Without their dedication, specialization, and support for academia, the economy struggles. Recruiting and retaining Science, Technology, Engineering and Mathematics faculty is essential to the welfare of the nation. It is also vital that the percent of women in STEM increased in order to foster a strong workforce. Although data pertaining to the number of STEM faculty have been collected over the past decades, in relation to overall job satisfaction, job importance and mentoring by STEM and Non-STEM faculty has not been analyzed and shared in a meaningful way that will help those involved to more effectively recruit and retain STEM faculty members. This study provides an in depth analysis of faculty satisfaction and mentoring in academia, which is instrumental in recruiting and retaining faculty in these areas.

This study focused on job satisfaction/fulfillment, importance and mentoring faculty in Science, Technology, Engineering and Mathematics (STEM). These issues are especially highlighted by gender and discipline (STEM vs. Non-STEM). Women faculty in STEM are underrepresented and highlighting job satisfaction, importance and mentoring differences by gender may provide important information for recruiting this critical group. The finding should be helpful to universities and to the professional STEM fields as they seek to recruit and retain STEM faculty and expand the percentage of women in the field.

Limitations/Delimitations of the Study

This research on job satisfaction, importance and mentoring has data limitations. 2011 data was used for this study for it was the year in which the COACHE survey had the highest number of faculty participation. As the data were divided by discipline, gender and tenure, the number of observations by different groups was smaller. Furthermore, several factors varied by the number of observations. Thus many observations were removed while using inferential statistics.

The faculty in the COACHE 2011 survey were enlisted in 49 postsecondary institutions in the United States. Those findings are representative of those participants in the 49 institutions. Job satisfaction and job importance factors in this study originated from several critical areas of faculty's job description. The parameters addressing job satisfaction, job importance and mentoring for faculty in this study include: Nature of the Work (overall, research, teaching and service); Resources & Support; Interdisciplinary Work; Collaboration; Mentoring; Tenure and Promotion; Institutional Governance & Leadership; Engagement; Work & Personal Life Balance; Climate; Culture & Collegiality; Appreciation & Recognition; Recruitment & Retention; and Global.

Definition of Terms

ANOVA – Also know as the Analysis of Variance. According to SAS/STAT(R) (9.2 User's Guide, Second Edition), ANOVA uses a "continuous response variable, known as a dependent variable, is measured under experimental conditions identified by classification variables, known as independent variables".

COACHE - "The Collaborative on Academic Careers in Higher Education (COACHE) is a Harvard-based consortium of institutional leaders who are taking cost-effective steps to improve outcomes in faculty recruitment, development, and retention. Under COACHE, academic leaders at more than 200 colleges, universities, and systems have strengthened their capacity to identify the drivers of faculty success and to implement informed changes". (http://sites.gse.harvard.edu/coache)

IPEDS – Institute of Education Science (IPEDS) belongs under the umbrella of the United States Department of Education.

Job Importance – On a scale from 1 to 5, faculty stated their level of importance pertaining to different aspects of their job (i.e. Nature of the Work (overall, research, teaching and service); Resources & Support; Interdisciplinary Work; Collaboration; Mentoring; Tenure and Promotion; Institutional Governance & Leadership; Engagement; Work & Personal Life Balance; Climate; Culture & Collegiality; Appreciation & Recognition; Recruitment & Retention; and Global).

Job Satisfaction/Fulfillment – Defined "as being the positive emotional reactions and attitudes an individual has towards their job." (& Oshagbemi, 1999, pg. 388-403) Or, "It is a bi-dimensional construct consisting of intrinsic and extrinsic satisfaction dimensions or alternatively of satisfaction/lack of satisfaction and dissatisfaction/lack of dissatisfaction dimensions". (Warr, 1979, pg. 129-48; Winefield, 1988, pg. 149-57)

Land Grant Institutions – According to the National Center for Education Statistics, "A land-grant college or university is an institution that has been designated by its state legislature or Congress to receive the benefits of the Morrill Acts of 1862 and 1890. The original mission of these institutions, as set forth in the first Morrill Act, was to teach agriculture, military tactics, and the mechanic arts as well as classical studies so that members of the working class could obtain a liberal, practical education".

Linear Regression - Linear Regression is used to predict a linear response (dependent variable) using a linear function of regressor (independent) variables SAS/STAT(R) (9.2 User's Guide, Second Edition).

Logistic Regression - "Logistic regression, also called a logit model, is used to model dichotomous outcome variables. In the logit model the log odds of the outcome is modeled as a linear combination of the predictor variables," (http://www.ats.ucla.edu/stat/sas/dae/logit.htm,).

Mentoring - "Mentoring is best described as a reciprocal and collaborative learning relationship between two (or more) individuals who share mutual responsibility and accountability for helping a mentee work toward achievement of clear and mutually defined learning goals", Zachary (2005).

National Science Foundation (NSF)– In 1950 the National Science Foundation Act was "established in the executive branch of the Government an independent agency to be

known as the National Science Foundation … The Foundation shall consist of a National Science Board … and a Director". "NSF is the only federal agency whose mission includes support for all fields of fundamental science and engineering, except for medical sciences," according to http://www.nsf.gov/about/.

NCES – National Center for Education Statistics – "NCES is located with the U.S. Department of Education and the Institute of Education Sciences. NCES' is "the primary federal entity for collecting and analyzing data related to education in the U.S. and other nations.

Non-STEM - Those fields that are not in Science, Technology, Engineering and Mathematics.

Ordinal Logistic Regression – "is used to predict an ordinal dependent variable given one or more independent variables. It can be considered as either a generalization of multiple linear regression or as a generalization of binomial logistic regression" (https://statistics.laerd.com/spss-tutorials/ordinal-regression-using-spss-statistics.php)

Research Institutions – Are institutions in higher education whose primary focus is conducting research. These institutions are either classified as Doctoral/Research – Extensive or Intensive.

S&E – Those fields that pertain to Science and Engineering

STEM - Is an acronym used for four major areas in the sciences - Science, Technology, Engineering, and Mathematics. The representation of disciplines within these fields may vary by institution, government agency, or organization. According to Koonce et al (2011), "Judith A. Ramaley, the former director of the National Science Foundation's Education Human Resources Division is credited with defining the science, technology, engineering and mathematics curriculum as STEM".

Organization of Study

This scope of this study is to identify differences in faculty job satisfaction, job importance and mentoring by gender and discipline. Further it addresses critical job satisfaction factors influencing faculty being mentored and mentoring within STEM and Non-STEM disciplines. To expand and accomplish these objectives, the study is divided into five major components: Introduction, Literature Review, Methods, Finding, and Conclusion.

Chapter I – This chapter introduces the study, and presents the statement of the problem, purpose of the study, research questions, significance of the study, limitations/delimitations of the study, and definition of terms.

Chapter II - The literature review provides published and concise material on faculty in higher education. This section entails a review of the literature pertaining to the research topic. The subtopics in this section are degrees awarded, faculty in higher education, mentoring, job satisfaction, and a summary.

Chapter III - Methods provides the steps needed to address the research questions in this study. This section includes the research design, purpose of study, research questions, data collection, demographics, data population, data analysis, and summary.

Chapter IV – This section provides the findings of the study and the analysis of the data. This section includes, research design, purpose of study, research questions, data analysis and summary. The data analysis portion includes job satisfaction, job importance, mentoring by discipline and gender. It also includes tenured and non-tenured faculty.

Chapter IV – This portion of the research presents a research summary, conclusion, and recommendations for further research.

Summary

Faculty have seen changes in teaching, research, service, and administration over the past decades. This study's main focus is on faculty in postsecondary education. The need for more women in higher positions in academia and an increase in STEM faculty are a basis for the research questions in this study. This study specifically examined differences in job satisfaction, job importance and mentoring by gender and discipline (STEM & Non-STEM). Further, it examines if there is a relationship between job satisfaction factors with mentoring of tenured and tenure-track faculty by discipline.

This study provides an introduction, the literature review, methods, findings, and conclusion with recommendations for future studies. The 2011 COACHE survey was used for this study, and enlisted participants from 49 institutions in postsecondary education across the United States. Therefore, this study's findings should assist decision

makers with information to create much-needed programs, provide guidance and make policy changes, which will assist faculty in their navigation through their career success in academia.

CHAPTER 2: REVIEW OF LITERATURE

This chapter provides a review of the literature on the topics relevant and critical to this research. It provides a pathway to four areas (i.e. degrees awarded, history, mentoring, and occupational job satisfaction/fulfillment and job importance) that lead to the creation and importance of this study. To illustrate and examine the need for more STEM faculty in the US, the first part of the literature review encompasses the number of degrees awarded by Bachelor's, Master's and Doctorate Degrees in the United States. The literature further investigates differences by gender and discipline (Science & Engineering vs. Non-Science & Engineering).

Part II of this chapter provides a synopsis of the history and the number of faculty participation in academia over the years. The literature in this part shows changes of faculty by rank, gender and field of study (STEM vs. Non-STEM). Following, Part III addresses mentoring for Pre- and Post-Doctoral students and faculty in higher education by gender rank and field of study (STEM vs. Non-STEM). Finally, the last part of this chapter details selected literature on occupational job satisfaction/fulfillment and occupational importance for faculty by gender, rank and field of study (STEM vs. Non-STEM).

Degrees Awarded

Bachelor's Degree in Science & Engineering

The National Science Foundation (NSF) was established in 1950 by Congress "*to promote the progress of science, to advance the national health, prosperity, and welfare; to secure the national defense*..." (www.nsf.gov/about/). The foundation is a major source for research areas such as mathematics and social sciences in postsecondary education.

The National Center for Science and Engineering (NCSES) falls under the NSF's umbrella. Its major work provides accurate and reliable statistical "*data on research and development, the US science and engineering workforce, the condition and progress of STEM education, and the competitiveness in these areas*" (www.nsf.gov/statistics/index.cfm). This section encompasses data and projections on Bachelor's, Master's and Doctorate Degrees awarded in the US. It provides data for discussion on degrees awarded at these levels, degrees awarded in Science and Engineering (S&E), by gender, and the concentration of degrees awarded within Science and Engineering.

Degrees at the Bachelor's level have increased over the past decade. The increase is seen both in Science & Engineering (S&E) and non- Science & Engineering (non-S&E) fields. Bachelor's degrees awarded increased overall from "399,00 in 2000 to 505,000 in 2009," (National Science Board, 2012). Of all the S&E degrees (social/behavioral sciences, biological/agricultural sciences, engineering, computer sciences, physical sciences, and mathematics) awarded, computer science is the only field that had seen a decrease but has relatively remained constant. Women in S&E have been awarded a

constant number of degrees at this level and tend to be highly concentrated in the soft sciences in 2009, (Bowen et al, 2012). Psychology, biological/agricultural sciences, and social sciences reported more than 50% of all degrees awarded were to women. Women earned less than 50% of S&E degrees in mathematics, physical sciences, computer sciences and engineering, respectively (See Figures 1 & 2 below).

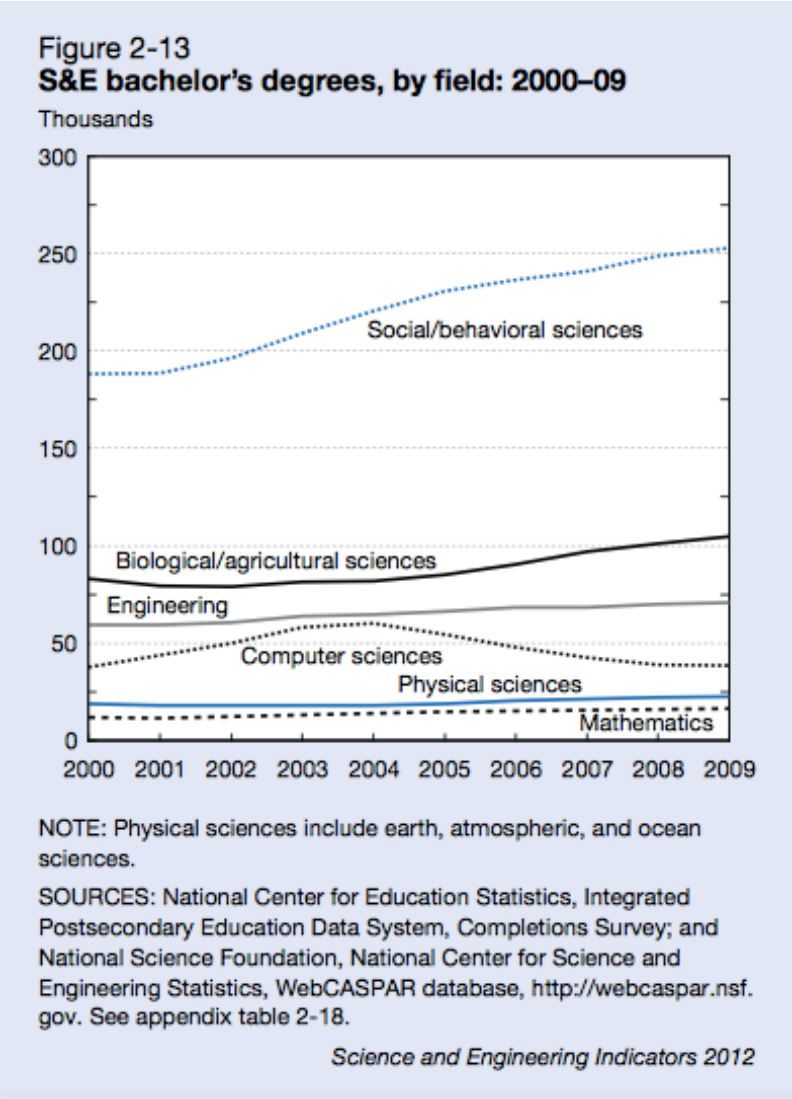


Figure 1. S&E Bachelor's degrees

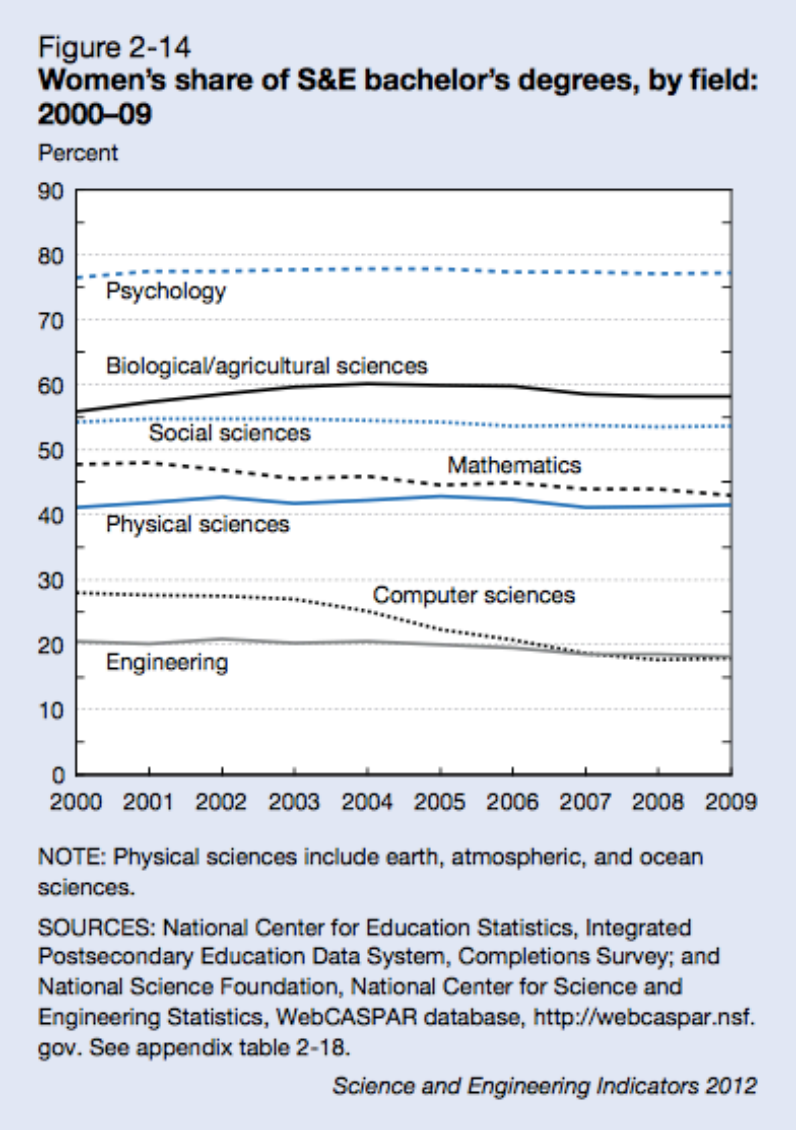


Figure 2. *Women's share of S&E Bachelor's degrees*

Student persistence and field changes at this level varies across discipline. Across all majors, 57.8% were persistent and graduated from a 4-year college or university in 2009. S&E (63.3%) students showed a higher percentage of persistence and degree completion than non-S&E (55.2%) students (National Science Board, 2012). This study conducted by the National Science Foundation showed that within S&E, agriculture/biological sciences (71.4%) students had a higher percentage of degree

completion than social/behavioral sciences (62.4%), Engineering (60.8%) and Physical/math/computer sciences (51.7%).

Table 1

Persistence and outcome of postsecondary students

Table 2-8
Persistence and outcome of postsecondary students beginning 4-year colleges or universities in 2004: 2009

Major in 2004	Number	Cumulative persistence outcome, 2009 (%)			
		Bachelor's	Associate's or certificate	Still enrolled	No longer enrolled
All majors	1,657,800	57.8	6.2	12.2	23.7
S&E	397,500	63.3	4.5	11.7	20.5
Agricultural/biological sciences	80,600	71.4	3.1	10.2	15.3
Physical/math/computer sciences	85,300	51.7	7.4	11.3	29.5
Engineering	107,300	60.8	4.5	14.2	20.5
Social/behavioral sciences	124,300	62.4	3.4	14.7	19.1
Non-S&E	790,900	55.2	7.3	13.0	24.5
Missing/undeclared	469,400	57.5	5.9	11.3	25.3

NOTE: Physical sciences include earth, atmospheric, and ocean sciences. Social sciences include history.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003–04 Beginning Postsecondary Students Longitudinal Study, Second Follow-Up (BPS:04/09), http://nces.ed.gov/datalab/index.aspx.

Science and Engineering Indicators 2012

National Science Board (2012) examined changes in student major for 4-year colleges or universities. Non-S&E (79.4%) reported the highest percentage of staying in the field of study and graduating. In S&E fields the highest percentage was seen in social/behavioral sciences (60.7%) compared to engineering (55.9%), agricultural/biological sciences (53.7%) and physical/math/computer science (43.0%). A high percentage of the students who switched from S&E fields changed to Non-S&E. These indicators also showed that students who were considered missing/undeclared chose to finish their degree in Non-S&E. Although there were small percentages of students from this group alloted to S&E, their numbers are significantly high.

Table 2

Field switching among postsecondary students

Table 2-9
Field switching among postsecondary students beginning 4-year colleges and universities in 2004: 2009

Major in 2004	Number	Major when last enrolled in 2009 (%)					
		Agricultural/ biological sciences	Physical/math/ computer sciences	Engineering	Social and behavioral sciences	Non-S&E	Undeclared/ not in degree program
All majors	1,387,700	6.8	5.7	5.8	15.5	60.7	5.6
S&E							
Agricultural/biological sciences	71,300	53.7	3.6	1.3	10.9	28.3	2.2
Physical/math/computer sciences	68,900	5.0	43.0	5.6	8.2	31.1	7.1
Engineering	95,500	2.7	10.1	55.9	3.5	22.3	5.4
Social/behavioral sciences	108,600	2.2	1.1	1.0	60.7	31.8	3.3
Non-S&E	651,500	3.5	2.5	1.5	7.7	79.4	5.4
Missing/undeclared	391,900	6.2	5.0	2.9	20.8	58.0	7.1

NOTES: Data excludes students who were not enrolled after July 2006, including those who had obtained their degree by that date. Physical sciences include earth, atmospheric, and ocean sciences. Social sciences include history.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 2003–04 Beginning Postsecondary Students Longitudinal Study, Second Follow-Up (BPS:04/09), http://nces.ed.gov/datalab/index.aspx.

Science and Engineering Indicators 2012

Master's Degree in Science & Engineering

Master's degrees steadily increased in the past decade. According to NSF report on degrees awarded at the Master's degree level, in 1966, women were awarded 47,588 degrees, while there were 93,184 Master's degrees awarded to men. Women earned only 33.8% of all Master's degrees for this year. In 2010, women earned 421,358 Master's degrees accounting to 60.3% of all Master's degrees. Men earned 277,170 Master's degrees in 2010 (www.nsf.gov/statistics/nsf13327/pdf/nsf13327.pdf). Since 2000, men outnumber women in S&E fields (National Science Board, 2012). The Figures below showed S&E fields from highest to lowest: engineering, social sciences, psychology, computer sciences, biological/agricultural sciences, physical sciences and mathematics respectively. All fields in this group with the exception of computer sciences saw a decrease from 2004-2007 and remained relatively constant in 2009.

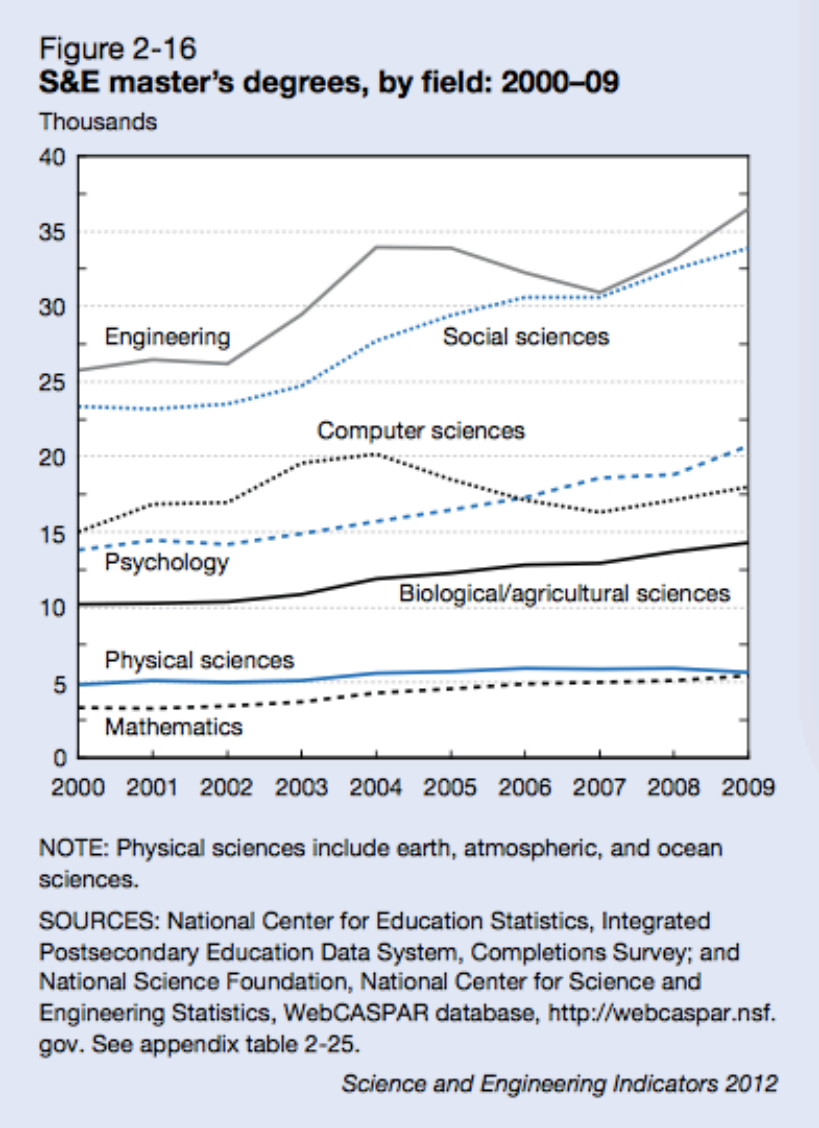


Figure 3. S&E Master's Degrees

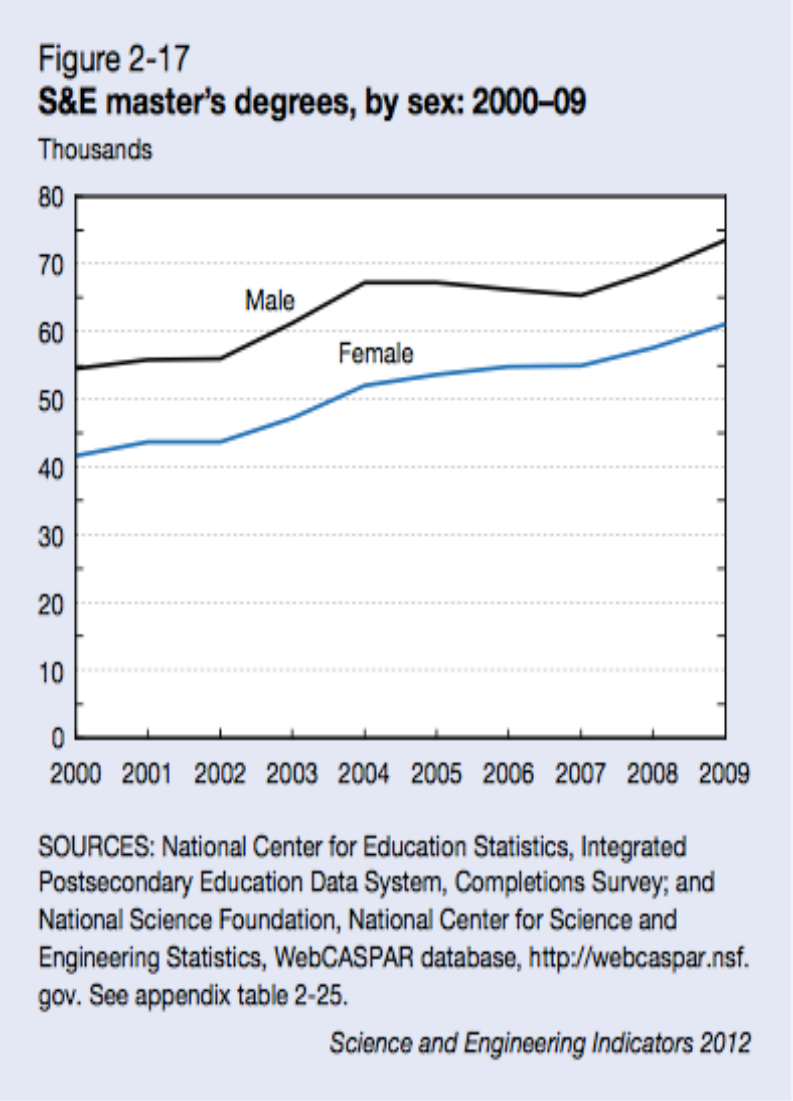


Figure 4. S&E Master's Degrees, by Gender

Doctorate Degrees in Science & Engineering

In 1966 (www.nsf.gov/statistics/nsf13327/pdf/nsf13327.pdf) a total of 17,949 doctorate degrees were awarded compared to 48,053 doctorate degrees in 2010; that is 167.12% increase since 1966. Women were awarded 2,086 (11.6%) doctorate degrees in 1966 compared to 15,863 to men. Shifting to 2010, women earned a total of 22,505 (46.8%) doctorate degrees compared to 25,548 doctorate degrees for men. Women at this level saw a steady increase in doctorate degrees since 1966.

National Science Board (2012), showed that in 2009 it takes graduate students 7.0 years (median) to complete a S&E doctorate degree for all institutions. At very high and high research activity research institutions, it took students 6.9 and 7.7 years respectively, and their primary support came from fellowship or traineeship, and research assistantship. Doctoral/research university's main support for the students at this level came from personal and unknown support and it took these students 9.2 years to complete their degree.

Table 3

Median Duration of S&E Doctorate Degrees

Table 2-10
Median number of years from entering graduate school to receipt of S&E doctorate, by 2010 Carnegie classification of doctorate-granting institution: 1995–2009

Year of doctorate	All institutions	Research universities (very high research activity)	Research universities (high research activity)	Doctoral/research universities	Medical schools and medical centers	Other/ not classified
1995	7.7	7.7	8.3	9.9	7.7	8.7
1996	7.7	7.7	8.6	9.2	7.7	8.7
1997	7.7	7.2	8.2	9.7	7.7	8.2
1998	7.3	7.2	8.2	9.2	6.9	7.7
1999	7.2	7.2	7.9	8.9	6.7	7.7
2000	7.5	7.2	8.2	9.2	7.2	7.9
2001	7.2	7.2	8.2	9.7	6.9	7.7
2002	7.5	7.2	8.2	9.9	6.9	7.7
2003	7.6	7.2	8.2	9.9	6.9	8.7
2004	7.2	7.0	8.0	9.2	6.9	7.6
2005	7.3	7.2	7.9	9.3	7.0	7.7
2006	7.2	7.0	7.9	9.0	6.9	7.5
2007	7.0	6.9	7.7	8.9	6.9	7.4
2008	7.0	6.9	7.7	8.9	6.7	7.4
2009	7.0	6.9	7.7	9.2	6.8	7.3

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations (2010) of Survey of Earned Doctorates.

Science and Engineering Indicators 2012

Table 4

Primary Support for S&E Doctorate Recipients

Table 2-5
Primary support mechanisms for S&E doctorate recipients, by 2010 Carnegie classification of doctorate-granting institution: 2009

Mechanism	All institutions	Research universities (very high research activity)	Research universities (high research activity)	Doctoral/research universities	Medical schools and medical centers	Other/not classified
Doctorate recipients (*n*)	35,564	27,166	5,275	1,123	1,184	816
All mechanisms (%)	100.0	100.0	100.0	100.0	100.0	100.0
Fellowship or traineeship	21.9	23.6	13.6	12.9	32.9	14.5
Grant	5.9	6.1	3.3	1.6	16.3	4.3
Teaching assistantship	15.2	15.2	21.3	8.8	1.6	4.5
Research assistantship	32.6	35.7	26.3	10.1	25.8	13.0
Other assistantship	0.6	0.5	1.1	0.4	0.7	0.5
Personal	10.2	6.8	18.0	39.3	10.6	31.5
Other	3.1	2.6	4.8	6.8	3.3	4.4
Unknown	10.6	9.6	11.7	20.2	8.8	27.3

NOTES: Personal support mechanisms include personal savings, other personal earnings, other family earnings or savings, and loans. Traineeships include internships and residency. Other support mechanisms include employer reimbursement or assistance, foreign support, and other sources. Percentages may not add to 100% because of rounding.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, special tabulations (2010) of Survey of Earned Doctorates.

Science and Engineering Indicators 2012

National Science Board (2012) from the National Science Foundation indicated that social/behaviroral sciences and biological/agricultural sciences had the highest numbers of docotrate degrees awarded in 2009 followed by engineering, medical/other life sciences, physical sciences, computer sciences and mathematics respectively. Also, a high number of temporary residents accounted to approximately 13,000 in 2009. "The number of U.S citizens and permanent resident earning doctorates in S&E increased from 8,700 in 2000 to 15,000 in 2009, while the number earned by men increased from 10,700 to 12,800 in the same time interval," (National Science Board, 2012). U.S. citizens and permanent resident women saw increases in S&E fields from 2000 to 2009, while U.S. citizens and permanent resident men saw increases with the exeption of agricultural sciences and psychology.

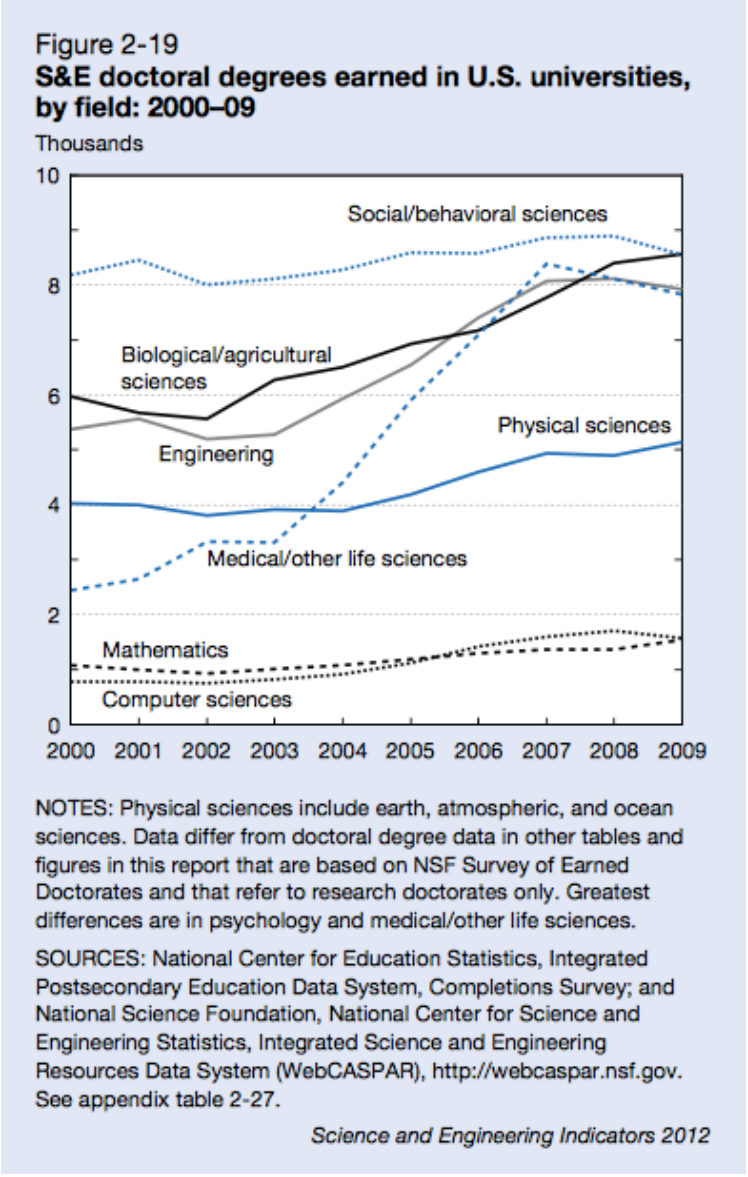


Figure 5. S&E Doctorate Degrees

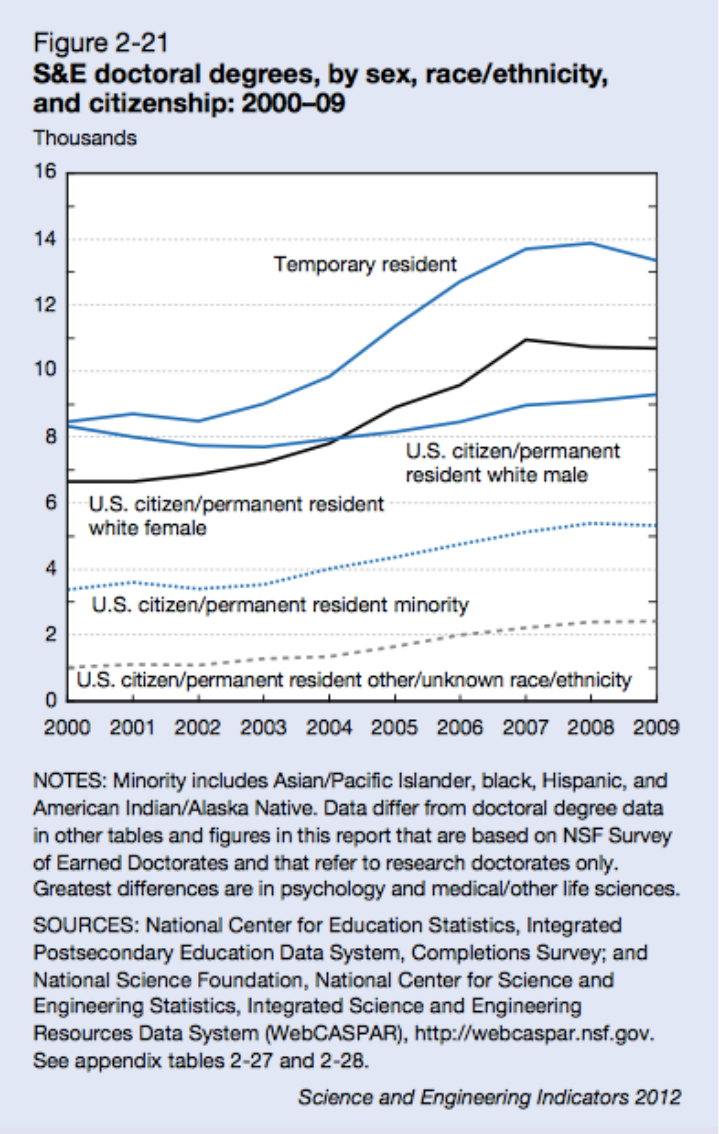


Figure 6. S&E Doctorate Degrees (Demographics)

Faculty in Higher Education

History & Trends of Faculty in Higher Education

Faculty in higher education has seen significant changes over the past 5 decades. Such changes have added to the shaping of faculty in teaching, research, extension, and administration. Faculty serve as a unique but complex entity in higher education. It has seen its roles change from tutors in the early 16th century to dynamic teachers, administrators and extension agents in the community. More importantly is the shaping of faculty by rank, discipline and gender.

"Mass Higher Education Era": 1945-1975 was considered an era of greatness. The United States was just coming out of World War II. This was a time when higher education was accessible (Geiger, 1999; Ward, 2003). The US population was 139.9 million in 1945 to 215.5 million in 1975. And, the number of students in higher education expanded from approximately 1.7 million (1945) to 11.2 million (1975). As the number of students increased, institutions saw an increase of "*students of diverse socioeconomic classes, races, ages, abilities, and gender*," (Ward, 2003, p. 36). This led to the expansion of institutions and faculty. The number of faculty expanded from 150,000 (1945) to 628,000 (1975), and the number of institutions grew to 3,004 in 1975 (Cohen and Kisker, 2009). This era was a period in which faculty formed unions and bargained for the benefit for their profession.

As the number of students enrolled in higher education increased, the number of professors and institutions increased. By the end of this era, faculty to student ratio increased to 1:17 according to Cohen and Kisker (2009). Also, the number of women faculty increased from 20% in 1945 to 33% in 1975. Cohen and Kisker (2009) stated that

women had higher representation at community colleges and at universities particularly in the humanities and social sciences. The numbers for women faculty increased during this period; but it was slower for minority groups. Affirmative action and equality by institution mandated by the federal Office of Civil Rights came to existence with the Civil Rights Act of 1964, Ward (2003). The Civil Rights Act of 1964 "*prohibits employment discrimination based on race, color, religion, sex and national origin*," (www.eeoc.gov/laws/statutes/titlevii.cfm). This act opened the doors to faculty in higher education especially women (33% in 1975) and minorities (Ward, 2003).

The Mass Higher Education Era saw the number of part-time faculty increase to 30% by the end of this period (Cohen & Kisker, 2009). The need to curtail expenses by administrators led to the increases in the number of part-time faculty. By this period, the professoriate was thought of as a well-established profession. There was an expansion of teaching and research during this period, Ward (2003). Faculty during this era saw an increased on their salary (Finkelstein, 1984 & Ward (2003). Cohen and Kisker (2009) show that faculty's median salary increased from $6,015 in 1957-1958 to $15,622 in 1974-1975.

The faculty's profession was centered in research, teaching and community services. Changes to the profession were seen late in this era. The "*partnerships between higher education and the federal government … forced universities to focus increasingly on research directly relevant to the needs of the federal government and consequently left less attention and support for more esoteric (and hence less applied) research*," (Ward, 2003, p. 37). Research became a focus in higher education due to involvement of federal government and institutions in higher education. Student

enrollment and budgets decreased; faculty distribution by area shifted due to student choice of field; faculty's autonomy on academics was shifting (Bowen and Schuster, 1986); and salary distribution by field of study varied across discipline (Cohen and Kisker, 2009).

A significant part of the shaping of faculty in higher education in the US can be attributed to academic freedom and unionization. In 1925, the Conference Statement on Academic Freedom and Tenure was officiated by the then Association of American Colleges and later the following year by the American Association of University professors (www.aaup.org/report/1940-statement-principles-academic-freedom-and-tenure). There were many cases where the court found itself between faculty and Board of Education or Board of Regents, which helped set the building blocks associated with Academic Freedom and Tenure.

According to Cohen and Kisker (2009), the court at the University of Wisconsin (Board of Regents v. Roth), found that the institution was not violating the termination of the faculty's contract after one year at the university. In contrast with Perry vs. Sandermann, the court ruled in favor of the professor who had been hired for ten consecutive academic years. In this case there was no tenure system, there was an expectation that the professor would be hired the following year; thus he should have been given an explanation and a hearing for why he was dismissed.

Unionization was an integral part of the history of faculty in higher education. Job satisfaction, fulfillment, and importance led faculty to embrace getting together for a come good. Depending on the type of institution, faculty had the right to gather as an organization to bargain. Public institutions were subjected to state law, whereas private

institutions fell under the federal law. It wasn't until the end of the era that faculty at private institutions were eligible to be part of a union. In 1974, 92,300 faculty of 331 institutions were organized into a bargaining group. Several unions, such as The National Education Association (NEA), Association of University Professors (AAUP), The American Federation of Teachers (AFT) arose and competitively sought faculty for their membership. Membership grew but plateaued at the end of the Mass Higher Education Era. The same was seen with respect to funding and function of institutions in higher education (Ward, 2003).

The following era, Consolidation Era, occurred during 1976 to 1993, which encompassed many new trends. Such trends were "*an aging population, increased participation in education at all levels, a higher ratio of women in the workforce, and more children being reared in single-parent homes*," (Cohen & Kisker, 2009, p. 307). The aging population added to the new and diverse set of faculty that replaced those in 1950s-1970s, Ward (2003). Seen during this time was the increase in the immigrant population. These trends attributed to the changes seen in faculty characteristics during these years. In 1969 faculty constituted 47% at universities, 39% at four-year colleges, and 15% at community colleges, (Finkelstein, Seal, and Schuster, 1998; Ward, 2003). According to the Center for Education Statistics (2007); U.S. Bureau of the Census (2000); the US population grew from 215.5 million in 1975 to 258.9 million in 1993. Likewise, student enrollment grew 14.3 million (1993) i.e. approximately 3.2 million more than in 1975. Faculty grew from 628,000 in 1975 to 915,500 in 1993; and institutions grew from 3,004 in 1975 to 3,638 in 1993.

The Consolidation Era showed an increase number of women in the professoriate. Although the number of women faculty increased during this period, across rank they were underrepresented. Women faculty had higher representation at community colleges than at research institutions (Cohen and Kisker, 2009; Townsend and Twombly, 2007). Cohen and Kisker (2009) state that although women had higher representation, women were not represented at the highest levels in higher education. Concerning underrepresented groups, they accounted to less than 5% in 1993.

Faculty salaries are unevenly distributed. According to the National Center for Education Statistics (2007), in 1992-1993 full-time faculty on average were paid $44,642. During this time, male professors ($48,249) were paid higher than average; and female professors ($38,323) were paid less than average. Women on average were paid comparatively similar to faculty at community colleges. Faculty at public four-year institutions were paid $46,440, and at private four-year institutions they were paid on average $46,353. Faculty at both private and public institutions was paid comparatively similar in 1992-1993. Salaries during this period varied across discipline. Faculty in Business ($49,223) and in Health ($55,624) was significantly paid higher than average faculty salary.

Faculty during the Consolidation Era were a collective bargaining group. Sixty five percent of the twenty five percent of faculty who were in this group were mostly from New York and California in 1992 (Cohen and Kisker, 2009). The majority of the faculty, who belonged to a union were found to be in public two-year and public four-year institutions. As a group, they had bargaining power particularly in areas of academic freedom, and tenure protection. According to the American Association of University

Professors (AAUP), "*Academic freedom is indispensable for quality of institutions in higher education*". Under the collective bargaining of the AAUP (http://www.aaup.org/issues-higher-education), it includes "*the unionization of all sectors of higher-education workforce- from tenure-line faculty to graduate student employees, and from academic professionals to support staff*." Also laws and regulations such as the Equal Pay Act in 1987, Age Discrimination in Employment Act of 1967, promotion and transparency assisted faculty to be at a level field in higher education.

No two-faculty members are the same. Teaching, research and community serviced weighted differently by individual. During this period, faculty were given tenure particularly based on research and teaching. Research was highly weighted for tenure. Cohen and Kisker (2009) show that full-time faculty on a weekly bases spent on average 55 hours. At private research institutions faculty contributed 35% in teaching while at community colleges, the percentage increased to 65% of their time. At research institutions faculty spent a higher percentage in research compared to community colleges where faculty spent a higher percentage in teaching than research. Despite these changes, there was the need for faculty to publish in order to get tenure at liberal arts colleges (Boyer, 1990; Fairweather 1996; and Ward, 2003).

At research institutions, faculty's productivity varied across institutions, disciplines and within disciplines. Measuring productivity across faculty is complex. Even at its simplest version, no two professors are the same. The same is noted with measuring faculty productivity by research, publications, grants awarded, student evaluation, mentoring, etc. Measuring faculty productivity gives rise to faculty satisfaction. Cohen and Kisker (2009, p. 363) noted that faculty "*derived satisfaction from the work they do,*

the autonomy they enjoy, their own activities; dissatisfaction relates to extrinsic demands, administrative intrusions on their workspace, and the salary they receive".

The Consolidation Era showed that more than 40 percent of all faculty were part-time. Part-time faculty were paid comparatively less than their counterparts. As a group with less power to voice for collective bargaining, they received very little benefits and compensation. Administrators see the role of part-time faculty as a means to save the institution money. Their main role is to teach and in many occasions part-time faculty teach at a relatively large student to faculty ratio.

During this era, there was a slight increase of 2.4% of women on tenure track in 1975 but a significant increase of 6.7% in full-time non-tenure track faculty positions for women in 1985 (Harper, Balwin, Gansneder & Chronister, 2001; American Association of University Professors, 1995). The professoriate during the Consolidation Era was seen as a diverse and unique set of individuals in higher education. Academic freedom, tenure, productivity and satisfaction are but a few areas in which faculty show diversity given the type of institution, state or federal funding, and type of discipline.

The Contemporary Era or postresearch university era was during 1994 to 2009 (Ward, 2003). The US population had grown from 263.1 million in 1994 to 295.9 million people in 2005 (National Center for Education Statistics, 2007; U.S. Bureau of the Census, 2000). Comparing the years 1994 to 2005, the year 1994 saw a total of 3,688 institutions, 924,000 faculty and 14.3 million students; while 2005 showed 4,276 institutions, 1,290,000 faculty, and 17.5 million students enrolled in higher education.

This era has seen shifts in faculty appointments. Tenure track positions during this time period have become fewer and fewer giving rise to part-time and non-tenured track

positions. Cohen and Kisker (2009) stated that in 2005 full-time faculty accounted to 52 percent, which has significantly changed from 60 percent in 1995. The number of women faculty increased but at the salary base they earned about 18 percent less than their counterparts. Although their numbers have increased they are highly represented at non-tenure track positions.

The National Center for Education Statistics (2007) revealed the average salary for faculty for 1993-1994 and 2006-2007. The average faculty salary for 2006-2007 was $68,585, that is $3,854 more than in 1993-1994. Similarly to earlier eras, women ($61,016) earned less and men ($74,167), who earned more than the faculty average in 2006-2007. That is a difference of $13,151. These numbers may reflect women's position in higher education. They are concentrated in community college, in non-tenure track, and part-time positions. Faculty at community colleges ($57,466) earned less than public four-year ($70,460) and private four-year ($73,636) institutions in 2006-2007. These were similar trends in 1993-1994. The disparities in salaries in higher education continue to increase by discipline. As it can be see with faculty, whose discipline are closest to the corporate world have higher paying jobs compared to faculty who are not.

Part-time faculty has drastically increased during this era. Faculty held part-time jobs for various reasons such as teaching after retiring or unavailable tenure-track positions to name a few. Their base salary for teaching a course by part-time faculty is significantly lower than a tenured or on tenure track faculty teaching the same course. Cohen and Brawer (2008) show that part-time faculty earned $2,900 compared to $7,500 for a full-time faculty in Illinois. On many occasions part-time faculty teach several courses across several campuses to compensate for being unable to acquire a full-time

position. "*Research universities have the highest percentage of full-time and tenure-eligible faculty who hold the most lucrative positions. However, they rely extensively on graduate student instructors to teach lower-level undergraduate courses and to free up faculty to focus on their research*," states Cohen and Kisker (2009, p. 489). Apart from earning significantly less in salary, part-time faculty do not enjoy the same privileges, benefits and collective bargaining as full-time and/or tenure track faculty enjoy.

The increase in part-time faculty has shifted faculty's role in higher education. Part-time faculty bargaining as a collective group has not been easy. Unions are working on issues affecting full-time and tenure-track faculty. As the number of full-time and tenure-track positions decrease, representation for part-time faculty will increase. Similarly, as full-time and tenure track positions decrease, faculty in this group are given a bigger task. Administrative work is becoming a part of their dossier. Likewise, the strength in numbers decreases, their power to bargain and be heard decreases.

Productivity and job satisfactions for faculty are diverse across campuses and disciplines in higher education. Cohen and Kisker (2009) stated that 62% of faculty time was spent in teaching, while 18% in research and in areas such as administrative work. Public four-year institutions and community colleges saw higher number of student to teacher ratio and the highest numbers in classroom hours. The number of student contact and classroom hours diminishes by disciplines related to those closely related to the corporate world. As with publications, faculty's ability to publish depended on the type of institution and discipline they are in. Community colleges reported the least amount of publications compared to four-year public and four-year private institutions in higher

education. Even at research institutions, discipline play a significant role on the number of published articles faculty produced.

Faculty providing service to the community is related to service within their department and inside/outside of institution. Faculty service inside and/or outside their institution weighs less than teaching and research for promotion and tenure. For example, student advising and mentoring take a significant amount of time away from research and teaching and is rarely rewarded (Boice, 2000; Ward, 2003). Ward (2003) describes this phenomenon as "*service to students is valued but rarely rewarded, and time spent in advising keeps the scholar from the work that is rewarded. This is the crux of the tension so many faculty face in their work lives*" (p. 59).

Faculty associations especially by discipline are other areas where faculty can spend a significant amount of their time. These associations are heavily dependent on faculty's collaboration and voluntary commitment to committees. Ward (2003) stated that faculty can spend not only a lot of time on committee tasks, but also on writing, editing and reviewing letters and journals within their associations. Very rare are these services recognized especially when research is the central focus for rewarding tenure (Berberet, 2000; Boice, 2000; Burgan, 1998; Fairweather, 1996; and Ward, 2003). In terms of academic freedom, "*the AAUP policy statement" and "the First Amendment (free speech), the Fourteenth Amendment (due process and equal protections), Title VII of the 1964 Civil Rights Act, the 1973 Americans with Disabilities Act, and the 1986 amendments to the Age Discrimination in Employment Act*" (Cohen and Kisker, 2009, p. 494) are the primary laws and regulations protecting faculty in higher education during this period.

The contemporary era shifted faculty from its strong base for collective bargaining and professionalism across institutions in higher education. As these institutions move to a more business like model, faculty bargaining power and representation decreases. Also, the type of leadership along with culture and discipline at institutions in higher education provide the quantity and quality of "*involvement in institutional affairs*," (Fairweather, 1996; Leslie, 2002; Ward, 2003). The coming era poses a challenging time for faculty in higher education. The 2007 recession adds to financial constraints institutions face such as state, federal budget cuts, and lower institutions' endowments.

Faculty by Rank & Gender

The roles and responsibilities of faculty in higher education have changed over the years. As faculty moves from an era when faculty were a 100% involved in all aspects of higher education, to one in which their profession is defined as a production model. Such drastic changes since the commencement of the professoriate has shaped higher education into a new direction. As faculty move to higher ranks in academia, the more involved they are in an institution's affairs (Austin and Gamson, 1983; Finkelstein, 1984; & Ward, 2003). Women faculty have increased in numbers particularly in the lower ranks of the professoriate. Although more senior faculty members are retiring, their tenure-track positions are not being filled. Also institutions are adopting a business like model; therefore, leading the way for more part-time or non-tenure track positions available at institutions in higher education.

Early in the colonial era, women and faculty rank were not part of the equation. Faculty in this period were mostly tutors and relatively few professors accounted for

entire faculty in higher education. Tutors and professors were entirely responsible for the curriculum and for teaching a vast majority of the courses. During this era, the professoriate was not considered a lucrative or professional job. Few tutors and professors were compensated and the majority were volunteers.

Many colleges and universities opened their doors particularly for women in the industrialized era. Nearly two thirds of all colleges and universities were admitting women by 1900 (Cohen and Kisker, 2009). Women's colleges and universities emphasized areas such as arts and humanities. Cohen and Kisker (2009) showed that "*the ratio of women had gone up to two in five and was to reach nearly half the undergraduates by 1920; it fell back to one-third by the end of the era*" (p. 123). This era brought significant changes to institutions in higher education particularly to the professoriate. Faculty significantly increased from 63,000 in 1970 to 1,677,000 in 1945. Faculty rank was at it earliest stages, but in the late 1900's, faculty rank stared to become established as assistant, associate and professor. University of Chicago proposed such a scheme. Junior faculty was given up to seven years to become tenured or dismissed by the university (Cohen and Kisker, 2009) in 1940. This system was widely embraced through institutions in higher education. Faculty started to organize and group around their interest in teaching and research. Departments by area of concentration started to form.

Following the industrialized era, the mass higher education era introduced Title IX in 1972, which "*prohibits sex discrimination in education*", (titleix.info). It paved the way for many women to enroll in institutions in higher education. This federal law opened the doors to women pursuing higher education especially in the mathematics and sciences.

Degrees awarded in the hard sciences for women increased slowly during this period. By 1975 women accounted for 33% of all faculty; and had higher representation in community colleges and in fields such as arts and humanities. (Cohen and Kisker, 2009). More women faculty entered institutions in higher education but their numbers at the top tiers in academia were slim to none especially at research institutions. The mass higher education era saw the increase of part-time faculty in higher education at community colleges.

The consolidation era saw more women in the workforce and more women enrolled at the undergraduate level. Women in the workforce accounted to 70% by 1990 (Cohen and Kisker, 2009). In 1993, the National Center for Education Statistics (2007) showed that women at the undergraduate level enrollment recorded 56% of total while the graduate level made 54%. Degrees earned by women varied by discipline. As the level of degree increases, the percentage of women earning a degree decreased. In 1993, women faculty accounted for 39% of faculty in higher education. Women had higher representation at the community college level, whereas at research institutions their numbers were lower.

In terms of compensation, women earned $6,319 less than the average salary for full-time faculty and $9,926 less than their counterparts in 1992-1993 (NCES, 2007). More complex is the disparities of salaries for women by discipline. Similarly to the previous eras, the advancement of women at the top tiers in higher education came particularly from a male dominated organization at the top (Cohen and Kisker, 2009). The productivity level for teaching differed by rank. Faculty at the higher ranks conduct less teaching and contact with students. Those at community college report more contact

hours with students and more teaching compared to those at research institutions (Cohen and Kisker, 2009). Changes in the contemporary era improved the number of women in faculty positions and rank for faculty has shifted.

In the contemporary era, the professoriate has slowly shifted and fallen under a corporate business world. Their roles have constantly shifted from an independent body to make collective decisions for their profession to a more top-down framework. This era accounted to 1,290,000 faculty members in higher education. Tenure track and full-time positions are decreasing in numbers giving rise to a high number of part-time professors in the US.

This has placed women at a disadvantage, in which they become ineligible for tenure track positions. Women in non-tenure track positions expressed several reasons for taking this type of position; "*family considerations; … tight academic job market; desire to concentrate on teaching rather than research; … hope that success in a nontenurable position would lead to a tenure-track appointment*," (Harper et al, 2001, p. 243). The researchers in this study showed that female faculty with a doctorate degree are at a disadvantage when seeking tenure-eligible positions; and a higher number of female tenure-track faculty were single (1/3) and childless (2 times likely) than men. Part-time faculty's salary is disproportionately less than full-time and/or tenure track faculty. Part-time faculty received less benefits and less bargaining power.

Women had higher representation as part-time faculty and less in the top tiers at an institution. Cohen and Kisker (2009) show that 41% of full-time faculty and 46% of associate professors were women in 2005. Higher representation of women than men were seen in "*nursing (98.4%), teacher education (65.3%), foreign languages (51.4%),*

English (50.2%) and general education (50.1)." (Allen, 1998; Harper, Baldwin, Gansneder, & Chronister, 2001, p. 240). And, women spent more time in teaching than research when compared to men. Although the number of women in faculty positions is increasing, the pay scale compared to male professors has changed very little.

Marschke et al developed a differential equations model to examine attrition rates for women faculty throughout their career (assistant, associate, and full professors). They examined five different cases, "Current Conditions, Equal Exits, Equal Hires, Equality, and Females Only", pertaining to changes in administration to see if any of the cases can significantly impact hiring, retention and attrition rates of female faculty at this institution.

1.) Current Conditions - If the current conditions for hiring, retaining and promotions remain the same, compared to men, female faculty will at no point reach 40% (Marschke et al, 2007). According to their study women will not reach parity and the closest they can reach is at 30% within the next 18 years.
2.) Equal Exits - This case presented the same proportion of women exiting (attrition) and retiring from the institution. No changes are made for recruiting new female faculty but the changes occur for female faculty already hired. Their results show that the proportion reaches a peaked and remained constant at 40% of women after 43 years for the institution (Marschke et al, 2007).
3.) Equal Hires – This case presented what happened to female faculty if there is equal hiring for both men and women, and no changes are made for retirement and attrition. Women faculty will not reach parity and will take 49 years to reach a peak of 43%. (Marschke et al, 2007)

4.) Equality – This case encompassed two other cases in this study (Equal Hires and Equal Exits). Faculty were hired at an equal percentage and equally distributed in attrition, retirement and promotion, (Marschke et al, 2007). It reached its peak of 50% of women in 57 years.

5.) Female only – This case illustrates if only females are hired at this institution and if attrition is proportionately equal. In just 4 years, female faculty would reach 50%. In this case, the whole university will have its faculty as all female in 70 years, (Marschke et al, 2007).

Hiring, promotion, attrition and retirement of faculty individually and collectively presents a diverse set of changes for faculty in higher education. Marschke et al (2007) from other studies (NSF ADVANCE program; An Agenda for Excellence, 2005; Brown, Ummersen, & Hill, 2002; Clark, 2004; Fogg, 2003; Williams, 2005; and Wilson, 2005) collectively combined 17 distinct policies that supported a gender balance of faculty in higher education. Table 5 shows the 17 distinct policies.

Table 5

17 Distinct Policies

#	**Policy Changes**
1	Identify potential candidates and contact them personally to ask them to apply for a position.
2	Expand job descriptions to broaden the pool of applicants.
3	Establish consensus in recruiting and hiring committees early on to identify desired qualifications and methods for recruiting women.
4	Clarify and distribute information on the tenure process, identify pertinent committees, and list department-specific criteria for tenure. Consider expanding the scope of acceptable productivity to include new forms and paradigms of scholarship.
5	Allow individuals to stop or set back the tenure clock, especially for faculty balancing work with childcare, elderly care, illnesses, or other types of family-related responsibilities or life balance issues.
6	Measure and monitor the campus climate for women via regular surveys of all types of faculty.

Table 5 Continued

7	Create campus centers where faculty can gather to discuss work and family life and to improve collegiality and mentoring among faculty. Some campuses have established centers for nursing mothers.
8	Offer adjusted service and/or teaching loads for new parents.
9	Provide all faculty and applicants with employment information, resources, and career services for their spouses or partners.
10	Provide childcare services on or near campus.
11	Regularly distribute information on all policies regarding tenure, family leave, harassment, violence, and honor codes.
12	Identify mentoring as a service contribution and develop further incentives or programs to encourage faculty to collaborate, coach, and mentor each other.
13	Expand health care options for faculty whose spouses or partners work at the university so they can coordinate rather than duplicate their benefits.
14	Conduct exit interviews when faculty leave or retire to help identify causes of attrition.
15	Offer part-time tracks for tenured faculty. These may be permanent tracks or temporary options for 1–5 years of an individual's career.
16	Establish opportunities for qualified individuals to return to academia if they leaked out of the pipeline. Eliminate stigmas and policies that penalize years spent out of the labor force, years spent working outside academia, time spent on family leave, or tenure clock stoppages.
17	Provide incentives for retirement such as part-time work or extended health care benefits.

Faculty by Field of Study (STEM vs. Non-STEM)

By Rank and Gender

The definition for STEM has various interpretations. Different departments or organizations include or exclude certain fields in STEM. Its definition may vary by organization. STEM stands for Science, Technology, Engineering, and Mathematics stemming from the National Science Foundation. Dr. Judith A Ramaley, who worked at the National Science Foundation, first adopted the word STEM. STEM education has received a lot of attention from the state and federal government.

Kuenzi (2008) pointed out that the US is trailing behind several countries in math literacy and science literacy as measured by International Student Assessment (PISA) in 2005. According to PISA organization, their survey is designed to test 15 year olds on their educational skills and knowledge. Based on these finding, they compare the

educational systems across countries. The most resent comparison was in 2012. There were 510,000 15-year-old students who took part of this assessment in areas particularly in science, mathematics and reading.

PISA (2012) results show that the United States ranked below average in mathematics out of 34 OECD (The Organization for Economic Cooperation and Development) countries. It also ranked 27th in mathematics, 17th in reading, and 20th in science. As for reading and science, the U.S. scored relatively close to the OECD average. Countries such as Singapore, Japan, Switzerland, Estonia, Finland, Canada, and Germany to name a few, scored higher and above average in mathematics. The top U.S. performers in mathematics were below OECD average by 3%. Only 2% of US students performed at Level 6. These numbers in deed are alarming given that the US is a powerhouse in the world.

In terms of gender, boys showed 11 score points higher than girls in mathematics across 38 countries and economies. At the top level in mathematics, boys scored 20 points higher than girls (OECD, 2012). In reading, girls outperform boys by a score of 38 points higher. Consistent with these data supporting a gender gap it appears to be decreasing in certain areas in education. For example, 14% of girls entering a tertiary institution, enrolled in science areas compared to 39% of boys (OECD, 2012).

Enrollment and degrees awarded in higher education is dependent on factors such as the economy, state and federal funding. Undergraduate enrollment increased by 155% and graduate enrollment increased 229% from 1970 to 2009 (Wright, et al, 2013). Degrees awarded in higher education in the United States have overall steadily increased according to the National Science Foundation. For 2010 data, there were 1,668,227 for

Bachelor's degrees, 698,528 for Master's degrees and 48,069 for Doctorate degrees students enrolled. Furthermore breaking down the number of degrees by gender gives a different picture.

Bachelor's Degrees in Science and Engineering (S&E) have remained relatively constant for the years 1966 and 2010. S&E Bachelor's degrees accounted for 31.5% of all degrees in 2010. And 50.3% of S&E Bachelor's degrees were awarded to women. At the Master's degree level, S&E accounted for 20% for which women earned 45.5%. Science and Engineering degrees at the doctorate level stands alone. In 2010, there were a total of 33,141 (68.9%) S&E degrees at the Doctorate level. Women accounted for 40.9% of all S&E degrees at this level. Further breaking down Science and Engineering degrees by discipline and gender gives a different picture as to the areas women and men are awarded at the Bachelor's, Master's and Doctorate.

The statistics on PISA results and the number of degrees earned in S&E provide fundamental information on the new generation of faculty in the United States. According to Austin (2002), "*the modern academic workplace is characterized by student diversity, new technologies, changing societal expectations, a shift in emphasis toward the learner, expanding faculty work loads, and a new labor market for faculty*," (p. 97). Such characteristics are the driving force for a faculty's careers. The number of faculty across gender and rank are critical for the stability in higher education. At the faculty level, the National Center for Education Statistics reported the number of faculty by rank, gender and ethnicity for the years 2007, 2009 and 2011. The total number of faculty was 703,463 in 2007, 728,977 in 2009 and 761,619 in 2011 (See Table 6). Faculty was distributed across rank for the three years. In 2011, the percentage by rank

for faculty was noted as: Professor (24%), Associate Professors (20%), Assistant Professor (23%), Instructors (14%), Lecturers (5%), and Other Faculty (14%). These percentages remained similar for 2007 and 2009.

Gender across faculty differs especially at the upper levels. Women as a percentage of the total remained relatively the same across rank. In 2001, women made up 54% and 56% at the Lecturers and Instructors positions respectively. As they climb the ladder by rank, these percentages shifted. Women made a total of 49%, 42% and 29% at the Assistant Professors, Associate Professors, and Professors level respectively. Women made a staggering small percentage of the total Professors across the three years. The shortage of women at this level is significant. A shortage of women in academia especially at the upper ranks can add a strain to female faculty as an advisor or mentor to other female students, especially if they are an underrepresented group in their area of discipline. Acting as a platform to represent the underrepresented group (female), is seen as a means for institutions to meet the standards of diversity (Aguirre, 2000; Baez 2000; Ward, 2003).

Table 6

Total Number of Faculty by Gender and Rank

	2007	2009						2011					
	Total	Total		Male		Female		Total		Male		Female	
Type of Faculty	Total	Total	% Diff	Num	%	Num	%	Total	% Diff	Num	%	Num	%
Professors	173,395	177,581	2%	127,931	72%	49,650	28%	181,508	2%	128,648	71%	52,860	29%
Associate Professors	143,692	148,981	4%	87,965	59%	61,016	41%	155,200	4%	89,741	58%	65,459	42%
Assistant Professors	168,508	171,639	2%	88,665	52%	82,974	48%	174,045	1%	88,168	51%	85,877	49%
Instructors	101,429	104,521	3%	46,762	45%	57,759	55%	109,054	4%	48,130	44%	60,924	56%
Lecturers	31,264	33,332	7%	15,724	47%	17,608	53%	34,477	3%	15,689	46%	18,788	54%
Other Faculty	85,175	92,923	9%	48,774	52%	44,149	48%	107,335	16 %	56,606	53%	50,729	47%
Total	**703,463**	**728,977**	**4%**	**415,821**	**57%**	**313,156**	**43%**	**761,619**	**4%**	**426,982**	**56%**	**334,637**	**44%**

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), Winter 2007-08, Winter 2009-10, and Winter 2011-12, Human Resources component, Fall Staff section. (This table was prepared July 2012.)

The number of faculty in higher education for 2007, 2009, and 2011 show the changes by rank and gender. Further taking these numbers and expressing them in terms of type of discipline yields a different picture. In 1993, The National Study of Postsecondary Faculty (NSOPF) reported on the Composition of Instructional Faculty and Staff: Fall, 1987 and Fall, 1992. This report "*describes instructional faculty and staff in these two time periods in terms of their employment status, rank, tenure status, highest degree, age, sex, race/ethnicity, and citizenship status, and highlights the changes that have occurred*".

Between 1987 and 1992 instructional faculty and staff for 4-year institutions increased from 562,843 to 604,828 (NSOPF, 1993, Appendix 1.). All fields in Agriculture/home economics, Business, Education, Engineering, Humanities, Natural Sciences, Social Science and All other fields saw increases from 1987 to 1992 with the exception of Fine Arts. The highest representation of both years is seen in Natural Sciences and Humanities. Full-time faculty and staff accounted for 67.1%. The highest percent change in full-time appointment by discipline was seen in the field of education. In 1987, faculty and staff in the field of education showed that 78% were employed as fulltime compared to 1992 (59.2%). The need of part-time instructional faculty and staff in higher education creates a shift in faculty leadership and representation.

Tenured instructional faculty and staff seem to represent the majority in higher education (i.e. 4-year institutions) in 1992 (55.5%) and 1987 (58.5%), (NSOPF, 1993, Appendix 2). While the number of faculty did increase during these two periods, as a percentage it noted a decrease. Agriculture/home economics, Natural Sciences and Social Sciences showed that their instructional faculty and staff at the full professor level

represented more than 40% within department, (NSOPF, 1993, Appendix 3). Five years earlier, Humanities and Engineering had above 40% representation within their department. Humanities had a 6.4% decrease while Engineering had 5.5% decrease during 1987 and 1992.

The National Study of Postsecondary Faculty (NSOPF) report in 1993 showed that 70.4% (1992) of all Full-time instructional faculty and staff were men (NSOPF, 1993, Appendix 4). Women did not reach parity both in 1987 and in 1992. In 1992, the results showed uneven representation of women by departments (i.e. Agriculture/home economics (22.7%), Business (23.6%), Education (47.3%), Engineering (5.8%), Fine Arts (32.7%), Humanities (37.8%), Natural Sciences (16.7%), Social Sciences (26.1%), and All other fields (31.7%)).

Harper et al (2001) study examined differences on tenure track across disciplines for women in higher education. Harper et al (2001) showed that those fields that depend on tenure and tenure track patterns for hiring are the least to hire women faculty. These disciplines are considered hard disciplines. The study also reported that Engineering and Natural Sciences showed the highest percentages of tenured and tenure-track faculty as well as the highest percentages obtained by male faculty (NSOPE, 1993; Harper et al, 2001). Women reported a higher percentage in non-tenure track positions for Humanities (62.7%), Education (62.1%), Fine Arts (53.7%); which are typically considered soft disciplines. Surprising, "*tenured and tenure-track men with and without a doctorate and non-tenure-track men without a doctorate make more than tenured and tenure-track women with a doctorate*," (Harper et al, 2001, p. 248).

In terms of productivity, women on average with a doctorate degree and tenure and tenure track published 1.9 refereed journal articles compared to men on tenured and tenure-track with a doctorate (2.9) and without a doctorate (2.5) in the same position (NSOPF, 1993; Harper et al, 2001). Women in this category were more concentrated in the soft disciplines. Women with non-tenure-track positions without a doctorate published the least amount of articles (0.5).

Mentoring

Definition of Mentoring

"*Mentoring is best described as a reciprocal and collaborative learning relationship between two (or more) individuals who share mutual responsibility and accountability for helping a mentee work toward achievement of clear and mutually defined learning goals*", (Zachary, 2005, p. 3). A couple of examples in mentoring in higher education occur between student and student; student and faculty; faculty and faculty; faculty and administrator; administrator and administrator; or a combination of these. Mentoring is a mutual relationship that grows. The contextual framework is best described by Eby, Rhodes, Allen (2007) into four sections:

1.) Austin (2002) describes mentoring as a partnership between people, which is exclusive.
2.) "Mentoring is a learning Partnership," (Garvey & Alfred, 2003: Jacobi, 1991; Peper, 1994; Roberts, 2000).
3.) "Mentoring is a process, defined by the types of support provided by the mentor to the protégé", (Jacobi, 1991; Kram, 1985).
4.) "A mentoring relationship is reciprocal, yet asymmetrical".

Austin (2002) describes mentoring as a partnership between people. No two mentoring relationships are the same. Mentoring relationships have all shapes and longevity. Some of these relationships encompass two individuals, while others involve more than two people, such as mentorship by a student or by a faculty member. Such relationship might exist for just a short period while others exist through an individual's career. At the faculty level, junior faculty can have multiple mentors during his/her career. The junior faculty might have a mentor for assisting him/her on teaching, while having others mentors for research and extension.

The second framework states that the mentoring relationship involves a learning process between mentor and mentee. The key ingredient to mentoring is learning, Zachary (2005). It is usually a goal such as collaboration between senior and junior faculty to publish a paper; student to grow in their area of interest; present at a conference; or succeed at obtaining tenure. Therefore, the mentoring relationship is guided primarily by the needs of the mentee, Zachary (2005). Next, mentoring is a Process, (Jacobi, 1991; Kram 1985). The support needed by the mentee/protégé is essential to succeeding towards the goals set during mentoring process. The support and the environment are critical to establishing a culture in which mentoring flourishes. This process takes time and energy during the mentorship. For example, faculty provide help sessions to support a student, the mentee, in meeting the goal – passing a course essential to their major.

Lastly, the mentoring relationship is mutual in nature. The benefits of this association go both ways. In many occasions, the relationship is guided by the mentee's needs but gives rise to new and surprising learning discoveries by the mentor. A student

at a postsecondary institution chooses an advisor whose area of concentration is mathematics. Upon carefully working on a project, the mentee's expertise in chemical engineering background is useful for completing the project. Mentoring doesn't necessarily mean that the relationship goes in one direction (mentor-to-mentee) but it can also go from mentee-to-mentor.

Mentoring of Pre- and Post-Doctoral Students

Pre- and Post-Doctoral students are diverse by field of study, gender, language, culture, family needs, finance needs, type of scholarship, and goals and aspirations to name a few. Upon graduation, they face the daunting task to successfully land a job. Many become faculty at an institution in higher education. To help them with this transition, institutions have the responsibility to provide them with a well-rounded education. The need to assist them to assimilate with their environment, cope with the demands of building a rewarding and successful career, and providing them with the necessary tools to support and educate the next generation of faculty is critical for the United States. With this in mind, administrators, faculty and students benefit from a mentoring relationship.

"*No two graduate and professional programs are identical, and no two students experience graduate or professional school in quite the same way*," (Weidman, Twale, Stein, 2001, p. v). Pre- and Post-Doctoral students face challenges and insecurities during their studies. Moyer, Salove, and Casey-Cannon (1999) investigated challenges female doctoral recipients and students face in academia. The researchers surveyed a total of 213 female participants. The two main focuses were on "*describing their most pressing professional and personal concerns; and what, if anything, they would change*

about their field or academia more generally," (Moyer, Salove, & Casey-Cannon, 1999, p. 607).

Moyer, Salovey, and Casey-Cannon (1999) findings showed 12 major concerns. The following shows the percentage of respondents, who expressed concerns: Employment (54% of participants); Financial (38%); Academic and professional development and professional issues (38%); Balancing the personal and professional sides of one's life (36%); Stress and time pressure (30%); Faculty, supervisors, or administrators (21%); Specific to race or ethnicity (19%); Lack of a supportive environment (17%); Emotional and Psychological health (17%); Being female (15%); Academic and scientific system (15%); and Securing grant money (10%). As for the changes they would like to see implemented in their area of discipline or academia are (Moyer, Salovey, & Casey-Cannon, 1999, p. 619):

- *Improvement having to do with the profession itself or professional conduct*
- *Modify the job/pay structure*
- *Improve or modify training process*
- *Reduce the tension between research vs. teaching or increasing emphasis given to teaching*
- *Improve the emotional, psychological, or social climate; increase opportunities or conditions for women*
- *Improve mentoring*
- *Increase ethnic or gender diversity*
- *Increase the family friendliness of academia*
- *Modify the structure of academic system*
- *Modify the tenure process; and reduce politics*

Moyer, Salovey, and Casey-Cannon (1999) summarized ways to improve mentoring to include more female faculty mentors and to assist faculty become better mentors. Thus providing students with more positive feedback, (Moyer, Salovey, and Casey-Cannon, 1999). Zachary (2000) states that mentors are seen as someone who facilitates a learning partnership with the protégé. Mentoring "*has moved from a product oriented model, characterized by the transfer of knowledge, to a process oriented model, relationship involving knowledge acquisition, application, and critical reflection*," (Zachary, 2000, pg. 4). Both sides of the relationship are to benefit from the partnership. Mentees can have several mentors throughout their careers. Each mentor can contribute towards different or similar aspects of the mentees' (student's) career or personal development. Mentors on the other-hand seek their own growth and development, (Zachary, 2000). They accomplish such goals through reflection, renewal, and regeneration.

Mentoring of Faculty in Higher Education
By Gender, Rank and Field of Study

The demands of faculty in higher education have changed throughout the history of the US. From early 1600's when faculty was viewed as tutors, student's guardians, and curriculum developers to a more departmental, research, teaching and service focused career. As the demands of research, teaching and service are the main focus of faculty success during this century, mentoring and orienting new faculty varies by the individual's department, field of study, gender, rank, type of institution and research interest.

Acker and Armenti (2004) study focuses on Sleepless in academia. The study showed that women tended to have high levels of stress, exhaustion, and sleeplessness, when balancing child rearing and pursuing an academic career (Acker and Armenti, 2004). Faculty, during tenure period reported high levels of stress. Their study showed that childcare was a major worry to single parents, (Acker and Armenti, 2004). They explained that older female faculty tended not to be concerned with balancing career and home. But, they still encountered barriers when moving towards full professorship. Apart from these challenges, women are less represented in fields particularly in Science, Technology, Engineering and Mathematics (STEM).

In 1997, the National Science Foundation reported that less than 7% were women in Engineering. And, when divided by rank; 7% of women were assistant professors, 3% were associate professors and only 1% were full professors. Fields in Science, Mathematics and Engineering are particularly male dominated. When women face such challenges as shortage of role models, representation, male dominated society in academia, it adds to the leaky pipeline (Mason et al, 2005). As women enter academia in STEM fields, their numbers rapidly decrease as they move towards the upper levels in academia; that is from earning a PhD in Science and Engineering, entering tenure track, associate professor, full professor to leadership positions.

Table 7 shows the differences of women and men in terms of motivation, group interaction, task engagement, and vision of success. According to Gilligan (1982) and Chesler and Chesler (2002), female need encouragement while male need to be challenged to be motivated. Interacting with a group, women need to feel integrated and men see the need to be separated. As for task engagement, women are collaborative

while men are competitive. In terms of their vision of success, men tend to look at the success as an individual achievement while women look at it as a group affiliation. Academia for science, mathematics and engineering is mostly a male dominated society.

Table 7

Motivation, Group Interaction, Task Engagement and Vision of Success by Gender

	Female	**Male**
Motivation	Encouragement	Challenge
Group Interaction	Integrated	Separated
Task Engagement	Collaborative	Competitive
Vision of Success	Group Affiliation	Individual Achievement

(Table Source: Chesler & Chesler 2002; Gilligan, 1982)

Mentoring is seen as a solution for keeping more women in science and engineering, (Chesler & Chesler, 2002). One-to-one mentoring, (Acker and Armenti, 2004) is used to cope with the challenges, stress and roadblocks facing women faculty in academia. "*Improving mentoring of women can have significant impact on their careers and lives, and on the academic climate and structure more generally*," (Chesler & Chesler, 2002, p. 50). In this study, Chesler & Chesler (2002), looked at types of mentoring of faculty in higher education – the Traditional Mentoring Models & Alternative Mentoring Models.

In the Traditional Mentoring Model the mentor and mentee/protégé build a relationship with set objectives and goals, whether they are short or long term. Such goals can come from gaining tenure; improving teaching or research; building a portfolio; personal and/or emotional wellbeing, grant writing, etc. This model represents a two-person relationship, mentor and protégé. Heroic Journey and Cross-Gender (and Cross Race) Mentoring represent the different types of the traditional mentoring for faculty in

higher education (Chesler & Chesler, 2002). For the Cross-Gender (and Cross Race), women in science and engineering choose preferably male mentors than female mentors. Despite that there are a few female mentors in academia graduate students and new faculty do not see female mentors as a viable option. Chesler & Chesler (2002) state that senior women in higher education are not seen as possible mentors due to the "*lack of power and influence in their department*" (pg. 51).

The idea of a faculty member needs only one mentor during their career is insufficient especially for women faculty in higher education. Chesler & Chesler (2000) illustrate three different alternative mentoring models –

1.) Multiple Mentoring – "*In an alternative model that can be conceptualized as either a spider web or Venn diagram of interconnected circles, multiple mentoring encourages the protégé to construct a mentoring community based on a diverse set of helpers instead of relying on a single mentor*," (Chesler & Chesler, 2000, p. 51-52). The protégé can have multiple mentors to help with different goals. For example the protégé can have multiple academic mentors. Independent academic mentors for teaching, research, outreach, or grant wiring to name a few.

2.) Peer Mentoring – Peer mentoring adds to another method of mentoring. This method provides individuals to mentor each other on the basis that there is no rank. This method is very flexible. "*This flexibility in time and level of commitment directly addresses problems women often experience with the traditional mentoring model; that is, unpredictable family and child-care responsibilities and career interruptions*," (Chesler & Chesler, 2000, p. 52).

3.) Collective Mentoring – "*Collective mentoring is an evolution of multiple mentor/single mentee model whereby senior colleagues and the department take responsibility for constructing and maintaining a mentoring team*," (Chesler & Chesler, 2000, p. 52). This type of mentoring involves the whole department being committed to mentoring of graduate students and early career faculty.

No two-faculty members are the same, despite that they come from the same institution, department, field of study and gender. Interests in teaching, research, and outreach may differ. Thus mentoring is tailored based on a faculty's goals and needs. Institutional mentoring structure is critical for recruiting and retaining faculty in higher education.

Occupational Job Satisfaction/Fulfillment and Occupational Importance for Faculty in Higher Education

Field, Rank and Gender

Job satisfaction is defined "*as being the positive emotional reactions and attitudes an individual has towards their job*" (Oshagbemi, 1999, pg. 388-403). Job Satisfaction is linked to employee motivation and performance, (Ostroff, 1992; Terpstra & Honoree, 2004). Ostroff (1992) collected data from 13,808 teachers in 298 schools. The teachers were surveyed on issues pertaining to employee satisfaction and attitude. The results showed "*that a relationship exists between satisfaction, attitudes, and performance at the organizational level*;" furthermore, the results showed that "*commitment was positively related to attendance and student satisfaction with teachers and negatively related to turnover*." (Ostroff, 1992, p. 968) This study represented responses from employees at

the high school level. Given that is study relates to job satisfaction at the high school level, later studies showed similar trends.

Terpstra & Honoree (2004) surveyed 490 faculty members from four-year institutions in the United States. This research investigated job satisfaction and pay satisfaction by type of field of study and region. According to their initial results, on a scale from 1 to 5 from very satisfied to unsatisfied in their job, Engineering (2.37), Humanities (2.25) and Sciences (2.13) were on average the least satisfied. Faculty in Liberal Arts (2.06), Education (1.98), Social Sciences (1.97), Business (1.94) and Law (1.45) reported being more satisfied than Engineering, Humanities and Sciences in their job. In terms of pay satisfaction, Sciences (3.08), Liberal Arts (2.88), and Humanities (2.87) reported less satisfied than their counterparts.

Cohen and Kisker (2009) noted that faculty "*derived satisfaction from the work they do, the autonomy they enjoy, their own activities; dissatisfaction relates to extrinsic demands, administrative intrusions on their workspace, and the salary they receive*" (p. 363). As with respect to gender, both men and women exhibited similar job and pay satisfaction (Terpstra & Honoree, 2004). Women reported job satisfaction of 2.08, while men reported 2.04 on a scale of 5. This shows that both men and women were satisfied with their job. In comparison, women reported on average 2.84 on pay satisfaction and men reported 2.82. In terms of faculty rank, researchers found that there was no significant difference between assistant, associate and full professors. Although there was no significant difference by rank, associate professors expressed less satisfaction with their job and assistant professors were more dissatisfied with their salary.

Contrary to previous research Terpstra & Honoree (2004) showed that sex/gender, age, seniority, academic rank, and tenure-status did not significantly impact job satisfaction in faculty in higher education. Although there were no significant difference by gender, discipline and rank, the study examined the scale by which faculty expressed their satisfaction at their job and salary. In the study by Turner and Myers (1999), the researchers found that "*satisfaction with teaching and working with students; supportive administrative leadership, mentoring relationships, and collegiality; and interaction with other faculty*" were the three main aspects relating to faculty job satisfaction for faculty of color (p. 50).

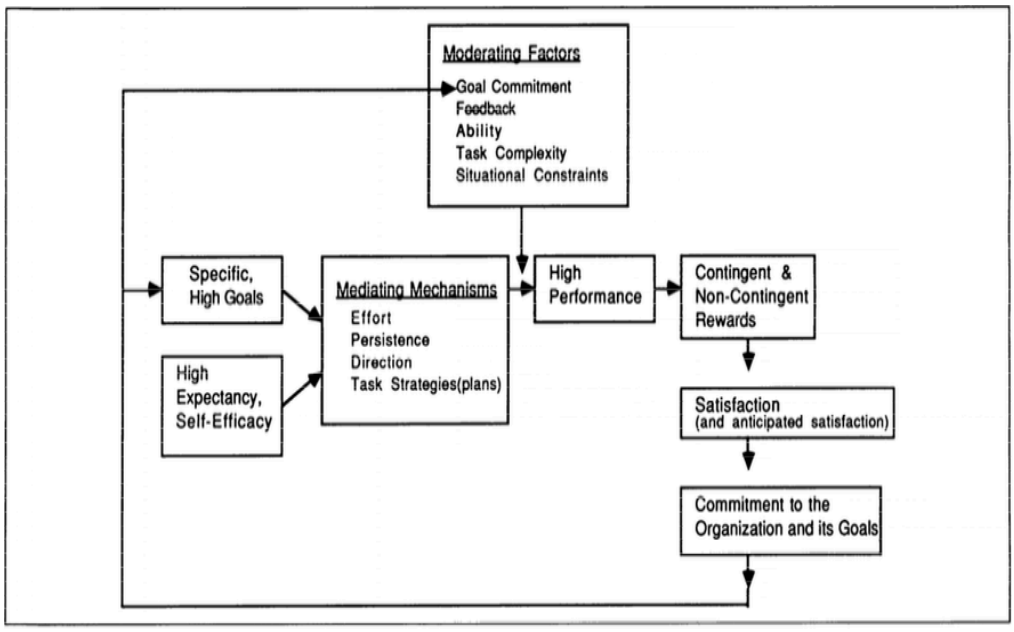
Other studies such as Olsen, Maple & Sage (1995) indicated that teaching, research and outreach are critical for faculty job satisfaction. How satisfied faculty in higher education are also linked to how they are valued within their department and institution (August & Waltman, 2004). Furthermore, there are significant differences in overall satisfaction for women faculty. August & Waltman (2004) discussed their results pertaining to job satisfaction for women in higher education. On overall satisfaction tenured women rated the following as highly significant at p-value < 0.10: comparable salary; chairperson relations; student relations; departmental influence; departmental climate, disparate workload and gender equity in salary (August & Waltman; 2004). When compared to nontenured women faculty, collegial peer relations; having a mentor; student relations; and departmental climate where significant at p-value < 0.05. This shows that in relation to mentoring, nontenured women faculty see it as marginally significant and a sense of overall satisfaction for them to have a mentor when compared to tenured women (August & Waltman; 2004). This study examined the importance of

having a mentor and overall satisfaction; but not in terms of being a mentor as a faculty member.

On another study by Locke & Latham (1990b) looks at high performance cycle. In terms of job satisfaction, when workers express high performance through "directions of attention and action, effort, persistence, and the development of task strategies and plans," it leads to a sense of feeling of satisfaction (p. 240). Locke & Latham (1990b) described "employees who feel successful in relation to goals at work …, who are rewarded equitably by the organization for their high performance and who receive equitable noncontingent rewards will generally feel satisfied with their job as a whole" (p. 244) Thus with a general sense of job satisfaction, employees are committed to the organization and its goals (Figure 7).

Figure 7

The High Performance Cycle



Conclusion

The number of degrees awarded at the Bachelor's, Master's, and Doctorate level have increased and significantly increased for women. The highest proportion of degrees were awarded at the Bachelor's level. Degrees awarded to women have significantly increased in Science & Engineering but underrepresented in the hard sciences. The pool of students generated at the postsecondary level directly impacts faculty in higher education.

History of faculty in higher education has evolved into different shapes and sizes. From its early days as tutors; to the dominant power of curriculum building and development; to a power struggle for maintaining academic freedom and bargaining power in academia. The number of faculty in the United States has steadily increased. Higher numbers of part-time, adjunct and non-tenure track faculty are reported as institutions of higher education. Higher education has continuously moved to a more business like model. Women faculty have steadily maintained an increasing trend but highly underrepresented in the higher levels in academia and in Science, Technology, Engineering and Mathematics.

Mentoring, and job satisfaction and fulfillment of faculty are complex and unique across institutions in higher education. Mentoring can occur between students and faculty, faculty and faculty, administration and faculty or a combination of these. Peer mentoring and multi-mentoring at the beginning of a faculty's early career can significantly influence their success in academia. Each relationship is unique and can require a vested amount of time between the mentor and protégé. And in many occasions mentoring is not seen as a part of faculty's portfolio for promotion when compared to

research and teaching. To prepare future faculty in higher education, role models are essentially important especially for underrepresented groups. Women and faculty of color are considered token faculty for they are a representation of their group. This can add great strain towards tenure and promotion.

As per job satisfaction and fulfillment, faculty in higher education are faced with the balancing act of successfully transitioning at the different levels in academia. Their level of satisfaction depends on the culture of their discipline, department, college, and institution. The demands of research, teaching, and outreach contribute to the level of satisfaction in their job. The added amount of responsibilities outside of academia directly impacts faculty's job satisfaction. As more female faculty enter academia, career and home becomes a fragile act of balancing. Thus more women are opting to accepting non-tenured track and adjunct positions in higher education, leading to little benefits such as lower salaries.

This dissertation research examines these increases and trends due to gender, salary and discipline. Further, we ask if job satisfaction/fulfillment and mentoring differ by discipline (STEM & Non-STEM), gender and within discipline differ by gender? And, what factors in job satisfaction/fulfillment impact faculty being mentored or engage in mentoring?

CHAPTER 3: METHODS

Introduction

Faculty have seen significant changes over the past few decades in higher education. They fit the roles of teachers, researchers, community service advocates, and mentors to name a few. With all of these roles to fill, it is of importance to examine their level of job satisfaction, job importance and mentoring. The recruitment and promotion of Science, Technology, Engineering, and Mathematics (STEM) faculty is essential especially for women in these fields. Little is known of their job satisfaction, job importance and mentoring for STEM faculty. And as well as for the relationship of job satisfaction factors influencing mentoring based on discipline and tenure status.

The first chapter looked at the background, statement of the problem, purpose, research questions, significance, limitations/delimitations, organization of the study. The literature review elaborated on degrees awarded, faculty in higher education, mentoring and job satisfaction particularly by gender, discipline, level, and rank. This chapter of the study describes the design of the study, sample, instrumentation, data collection and data analysis.

Purpose of the Study

The purpose of this study was to examine faculty's job satisfaction/fulfillment, job importance and mentoring by gender and type of discipline (STEM vs. Non-STEM) using the 2011 Collaborative on Academic Careers in Higher Education (COACHE)

survey. "(COACHE) is a Harvard-based consortium of institutional leaders who are taking cost-effective steps to improve outcomes in faculty recruitment, development, and retention." (http://sites.gse.harvard.edu/coache) This discussion section adds to a growing body of literature on recruitment and retention of faculty in STEM particularly the differences these faculty encounter in job satisfaction/fulfillment and mentoring to Non-STEM faculty. This study also examined job satisfaction factors influencing faculty being mentored and those mentoring in STEM and Non-STEM fields.

Research Questions

1.) To what extent is there a difference between STEM and Non-STEM faculty members in terms of job satisfaction/fulfillment, occupational importance and mentoring?
2.) What is the relationship of gender in regard to job satisfaction/fulfillment, job importance, and mentoring and STEM & Non-STEM academic mentors?
3.) What job satisfaction/fulfillment factors relate to the importance of a pre-tenured faculty succeeding as a faculty member (STEM vs. Non-STEM)?
4.) What job satisfaction/fulfillment factors relate to the likelihood that tenured faculty mentor in their department?

Design of the Study

The study focused on faculty issues pertaining to job satisfaction, job importance and mentoring in higher education. It examined faculty job satisfaction and fulfillment, job importance and its relationship to mentoring for STEM vs. Non-STEM faculty by gender. The last element dealt with job satisfaction variables as a regressor of mentoring by

discipline and tenure status. This study used both descriptive and inferential statistics to expand the literature on STEM vs. Non-STEM faculty in higher education. The researcher examined data from the 2011 COACHE survey. This instrument is described in more detail in the sections that follow.

Instrumentation

The Collaborative on Academic Careers in Higher Education Survey (CAOCHE) is used to collect data from faculty in higher education on issues pertaining to "*recruitment, development, and retention*," (http://sites.gse.harvard.edu/coache). Faculty through institutions, who are collaborating with COACHE, are asked to voluntarily participate in the survey. In turn, it provides data driven analysis to colleges and universities so as to "*identify the drivers of faculty success and to implement informed change*" at their institutions (http://sites.gse.harvard.edu/coache). The COACHE survey is available to four-year institutions in higher education. And, the COACHE survey provides institutional reports, which provides analysis and benchmarking on issues pertaining to faculty.

The COACHE survey examines differences using descriptive and inferential statistics on faculty affairs based on gender, race/ethnicity, tenure status, area of discipline to name a few. It provides differences along peer institutions and compares these finding to reports throughout the country. Along with the comparisons, the COACHE survey provides an avenue for faculty to comment on "open-ended questions; and accompanied by a unit-record data file (with acceptance of IRB-approved terms of confidentiality," http://sites.gse.harvard.edu/coache/membership.

This study uses data from 2011 COACHE survey. The researcher applied and was granted access to the COACHE survey. To qualify for eligibility, the researcher filled an application form, signed the restricted data use agreement, and provided a description of the proposal of the study. Data from the 2011 COACHE survey was used because of the high faculty participation compared to previous years. There were 49 colleges and universities participating in the 2011 COACHE survey.

The COACHE survey encompasses questions pertaining to pre-tenured and tenured faculty on already established aspects of faculty life: Nature of the Work (Overall, Research, Teaching, and Service); Resources & Support; Interdisciplinary Work; Collaboration; Mentoring; Tenure and Promotion; Institutional Governance & Leadership; Engagement; Work & Personal Life Balance; Climate; Culture & Collegiality; Appreciation & Recognition; Recruitment & Retention; and Global Satisfaction.

Data Population

This study focuses on faculty categorized by discipline (STEM vs. Non-STEM), gender (female vs. male) and tenure status (not on tenure track, on tenure track and tenured). The following institutions (Table 8) participated in the 2011 COACHE survey and were instrumental for answering the set of research questions in this study (i.e. questions pertaining to faculty in STEM and Non-STEM, job satisfaction/fulfillment, job importance, and mentoring):

Table 8

Institutions who participated in the 2011 COACHE survey

Participants - 2011 COACHE Survey	Participants - 2011 COACHE Survey
Appalachian State University	North Dakota State University
Christopher Newport University	Purdue University
Clemson University	Queens College-CUNY
College of the Holy Cross	Saint Mary's College of Maryland
College of Staten Island-CUNY	Saint Olaf College
Eastern Carolina University	Stonehill College
Fayetteville State University	SUNY Brockport
Hamilton College	SUNY Oneonta
Hobart & William Smith Colleges	SUNY Geneseo
Hunter College-CUNY	SUNY IT
James Madison University	Tulane University
John Jay College of Criminal Justice-CUNY	University at Albany SUNY
Johns Hopkins University	University of Buffalo SUNY
Kansas State University	University of Kansas
Kenyon College	University of North Carolina, Chapel Hill
Lehman College-CUNY	University of North Carolina at Charlotte
Lincoln University	University of North Carolina at Greensboro
Loyola University Maryland	University of Saint Thomas
Merrimack College	University of Tennessee Knoxville
Middlebury College	University of Wisconsin - Parkside
Mount Holyoke College	West Virginia University
New York City College of Technology-CUNY	Western Carolina University
North Carolina Central University	City University of New York
North Carolina State University	State University of New York
	University of North Carolina

For the purposes of this study, faculty was divided into two areas those in Science, Technology, Engineering and Mathematics (STEM) and Non-STEM. Social Sciences, Humanities, Visual & Performing Arts, Business, Education and Other Professions were considered Non-STEM. Physical Sciences; Biological Sciences; Engineering, Computer Science, Mathematics & Statistics; Health & Human Ecology; Medical Schools & Health

Professionals; and Agriculture, Natural Resources, & Environmental Sciences faculty were considered STEM discipline.

This study uses data collected by the 2011 COACHE survey. There were 49 colleges and universities participating in the 2011 COACHE survey. There were 392 variables depicting aspects of faculty's life (Nature of the Work (Overall, Research, Teaching, and Service); Resources & Support; Interdisciplinary Work; Collaboration; Mentoring; Tenure and Promotion; Institutional Governance & Leadership; Engagement; Work & Personal Life Balance; Climate; Culture & Collegiality; Appreciation & Recognition; Recruitment & Retention; and Global Satisfaction).

There were a total of 77,720 participants in the COACHE survey from 2005 to 2011. Of the population, 52.4% or 40,754 faculty was categorized by gender and fell either on STEM (Science, Technology, Engineering and Mathematics), Non-STEM, Other Professions or Unspecified (see *Table 9*). Non-STEM consisted of 10,372 male (324 NTT - not on tenure track, 5,375 on TT - tenure track and 4,673 T - tenured) and 9718 female (413 NTT - not on tenure track, 5,850 on TT - tenure track, and 3,455 T - tenured). There were 11,326 male faculty (444 not on tenure track, 5,635 on tenure track and 5,447 tenured), and 5,967 female faculty (462 not on tenure track, 3,659 on tenure track, and 1,846 tenured) in STEM.

Table 9

Faculty by gender, rank and discipline

Final gender designation [COACHE]			Faculty Field				Total
			STEM	Non-STEM	Other Professions	Unspecified	
Male	Self-reported tenure status [Q20/Q21]	NTT	444	324	101	101	970
		TT	5635	5375	689	93	11792
		T	5247	4673	472	312	10704
	Total		11326	10372	1262	506	23466
Female	Self-reported tenure status [Q20/Q21]	NTT	462	413	84	94	1053
		TT	3659	5850	736	111	10356
		T	1846	3455	345	233	5879
	Total		5967	9718	1165	438	17288

Data Collection

The 2011 COACHE data was used to answer these research questions in this study. The availability of the COACHE 2011 data was possible through the COACHE application process. COACHE is under the umbrella of the Graduate School of Education at Harvard University, which granted special permission for this study. Pre-tenured and tenured faculty who participate in the COACHE survey are typically asked questions pertaining to several aspects of faculty life. In return for their participation and membership, institutions are provided a detailed analysis of their institution's progress report as well as benchmarking their results with comparative institutions around them.

While COACHE produced data from 2005 through 2012, the COACHE 2011 survey had the highest faculty participation stemming from 49 institutions. Thus, 2011 survey results were selected for this study. Data from the COACHE instrument were

used to address the questions on job satisfaction/fulfillment, job importance and mentoring by gender and discipline. It was also used to identify job satisfaction variables as a regressor of mentoring by discipline and tenure status.

Data Analysis

Both descriptive and inferential statistics were used to analyze the findings for this study. Descriptive statistics were used to identify demographic factors to describe 2011 data from the COACHE survey. These factors include faculty by discipline, tenure, gender, job satisfaction/fulfillment, job importance, and mentoring. ANOVA was used to address differences in job satisfaction/fulfillment, job importance and mentoring for faculty by discipline and gender. ANOVA (Analysis of Variance) "is a statistical technique used to evaluate the size of the difference between set of scores," (Gamst, Meyers, & Guarino; 2008).

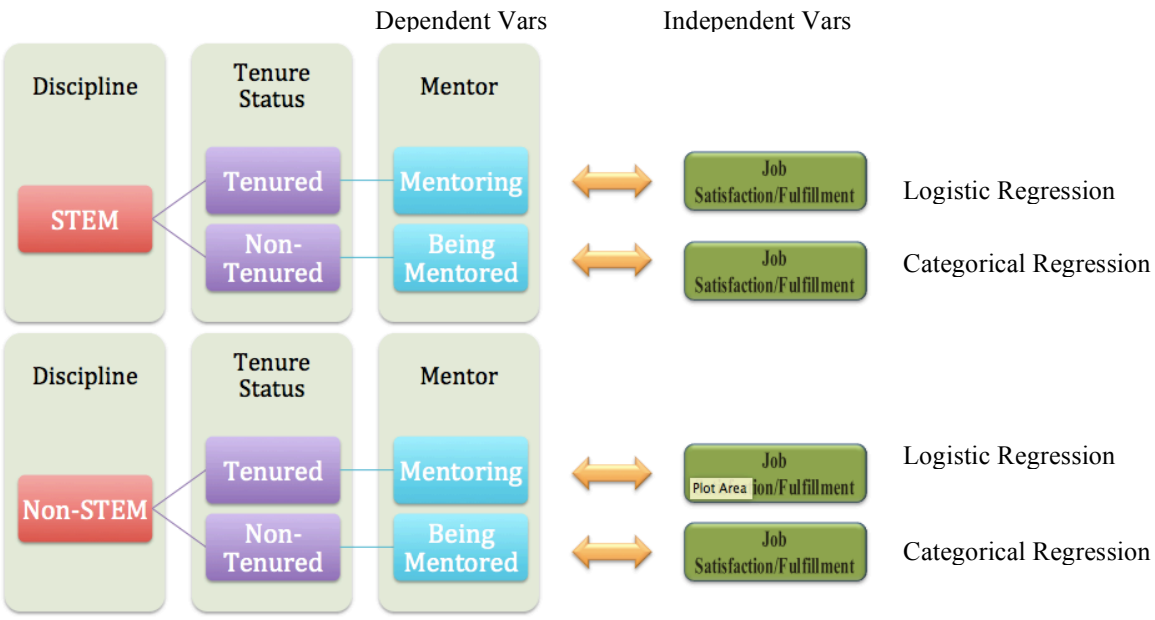
Ordinal Logistic Regression was used to examine job satisfaction/fulfillment factors influencing how important these factors were to their success as a faculty member for pre-tenured faculty in having a mentor(s) in their department. Ordinal Logistic Regression "*is used to predict an ordinal dependent variable given one or more independent variables*." (https://statistics.laerd.com/spss-tutorials/ordinal-regression-using-spss-statistics.php). Also, Logistic Regression was used to validate job satisfaction/fulfillment factors showing the likelihood of tenured faculty to mentor pre-tenure and post-tenure faculty. "Logistic regression, also called a logit model, is used to model dichotomous outcome variables. In the logit model, the log odds of the outcome is modeled as a linear combination of the predictor variables".

(http://www.ats.ucla.edu/stat/sas/dae/logit.htm) Therefore, this technique was considered appropriate for this study.

The following figure depicts how the data was divided to ensure the proper inferential statistical (logistic and ordinal regression analysis) methods used. The data is divided by discipline (STEM and Non-STEM), Tenure Status (Tenured – T and Tenure Track – TT), and Mentor (Mentoring and Being Mentored). Therefore, logistic regression was used to validate job satisfaction/fulfillment (independent variables) factors showing the likelihood of tenured faculty to mentor (dependent variables) pre-tenure and post-tenure faculty by discipline. On the other-side ordinal logistic regression was used to examine job satisfaction/fulfillment (independent variables) factors influencing how important these factors were to their success as a faculty member for pre-tenured faculty in having a mentor(s) (dependent variables) in their department by discipline.

Figure 8

Variables and Data Selection



Summary

This study focuses on job satisfaction, job importance and mentoring of faculty by gender and discipline (STEM vs. Non-STEM). Data from the 2011 COACHE survey was used answer the research questions in this study. This chapter discusses the purpose, design, instrumentation, data population, data collection and data analysis of the study.

CHAPTER 4: RESULTS

This chapter presents the finding of the study by presenting an analysis of the 2011 COACHE data to address each of the research questions. The chapter displays the demographics based on type of discipline, gender and tenure status. It highlights job satisfaction/fulfillment, importance and mentoring variables by discipline, gender and/or within discipline by gender. Lastly, it provides models in reference to job satisfaction factors influencing faculty mentoring by type of discipline and tenure status. The data were analyzed using the SPSS statistical package.

Purpose of the Study

The purpose of this study was to examine faculty's job satisfaction/fulfillment, job importance and mentoring by gender and type of discipline (STEM vs. Non-STEM) using the 2011 Collaborative on Academic Careers in Higher Education (COACHE) survey. "(COACHE) is a Harvard-based consortium of institutional leaders who are taking cost-effective steps to improve outcomes in faculty recruitment, development, and retention." (http://sites.gse.harvard.edu/coache) This discussion section adds to a growing body of literature on recruitment and retention of faculty in STEM particularly the differences these faculty encounter in job satisfaction/fulfillment and mentoring to Non-STEM faculty. This study also examined job satisfaction factors influencing faculty being mentored and those mentoring in STEM and Non-STEM fields.

Research Questions

There were four research questions:

1.) To what extent is there a difference between STEM and Non-STEM faculty members in terms of job satisfaction/fulfillment, occupational importance and mentoring?

2.) To what extent is there a relationship of gender in regard to job satisfaction/fulfillment, job importance, and mentoring and STEM & Non-STEM academic mentors?

3.) What job satisfaction/fulfillment factors relate to the importance of a pre-tenured faculty succeeding as a faculty member (STEM vs. Non-STEM)?

4.) What job satisfaction/fulfillment factors relate to the likelihood that tenured faculty mentor in their department?

Demographic Information COACHE Survey

COACHE Survey

The COACHE survey data contains 77,720 observations compiled from 2005 to 2012. Years 2011 (28,968) and 2012 (16,782) show a high number of faculty participating in the COACHE survey. Along with these observations there are 392 variables depicting issues affecting faculty in higher education. Table 10 displays the distribution of faculty participation in the survey from 2005 to 2012. Faculty in this survey were mostly from public institutions compared to private institutions.

Table 10

Number of Participants in COACHE Survey

Number of Participants by Year				
Year	**Public**	**Private**	**Total Public/Private**	**Total**
2005	3874	992	4866	8310
2006	1456	694	2150	3478
2007	1271	329	1600	2460
2008	3552	902	4454	7800
2009	1653	377	2030	3615
2010	5816	491	6307	6307
2011	23877	5091	28968	28968
2012	12568	4214	16782	16782
Total	54,067	13,090	67,157	77,720

Most of the participants indicated they were full-time faculty in the assistant, associate, and full professor positions. Majority of the faculty were on tenure track or are tenured faculty at their institution. Faculty primarily represented the following academic area of study: Humanities, Social Sciences, Biological Sciences, Visual & Performing Arts, Engineering/Computer Science/Math/Statistics, Health & Human Ecology, Agriculture/Natural Resources/Environmental Science, Business, Education, and Medical Schools & Health Professions. For the purposes of this study, these academic areas of study were divided into two categories STEM and Non-STEM fields (i.e. Diagram 1). Non-STEM fields for this study includes faculty in the Humanities, Visual& Performing Arts, Business, Education, and Social Sciences. STEM faculty were represented in the Physical Sciences, Biological Sciences, Engineering/Computer/Science/Math/Statistics, Health & Human Ecology, Agriculture/Natural Resources/Environmental Science, and Medical Schools & Health Professions.

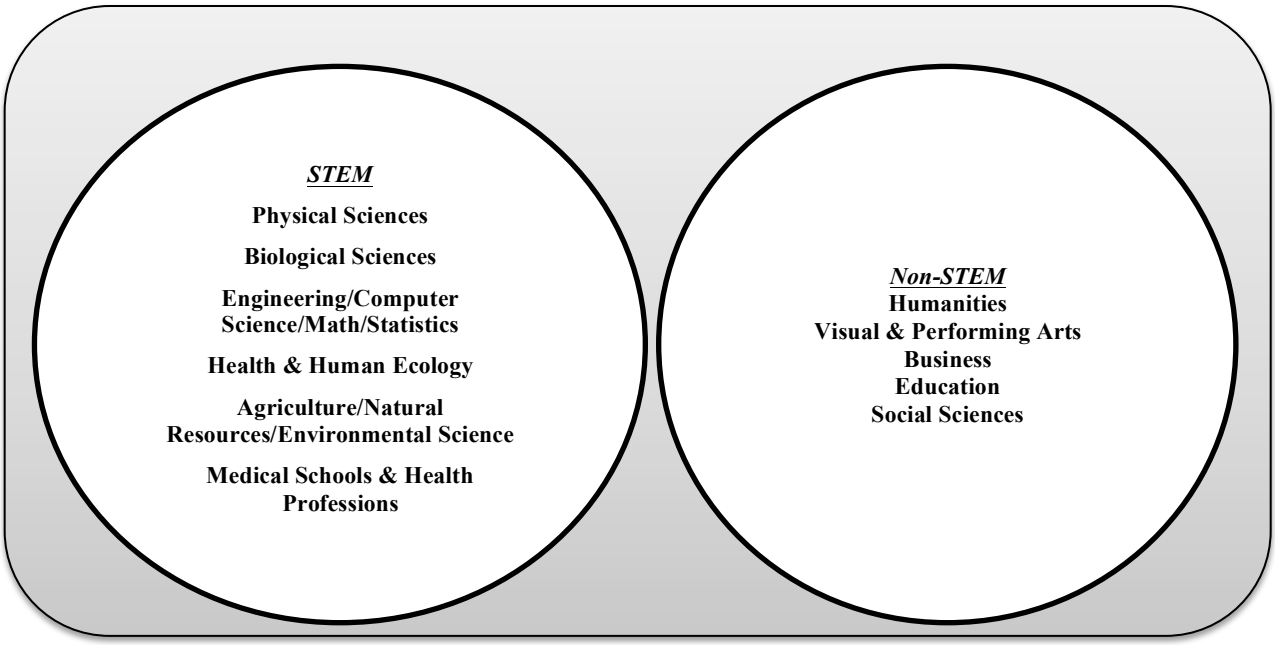


Figure 9. Venn Diagram showing the separation of faculty by discipline

COACHE 2011 Survey

Faculty by STEM vs. Non-STEM and Gender

In 2011 and 2012, faculty had the highest representation in Humanities, Social Sciences, Engineering/Computer Science/Math/Statistics, and Medical Schools & Health Professions (Table 11). In 2011 there were 28,968 participants of which 14,284 (8,472 male vs. 5,812 female) responded to the question concerning gender. Faculty were separated by STEM and Non-STEM fields. There were 5,924 in STEM and 5,639 in Non-STEM disciplines. The rest of the faculty responded to Other Professions or Unspecified their field. Male faculty had higher representation when compared to female faculty in the COACHE survey by STEM and Non-STEM disciplines. Male faculty in STEM accounted for 3,938 and in Non-STEM accounted for 2,987 participants (Table

12*)*. On the other hand, female faculty in STEM accounted for only 1,986 and in Non-STEM they were 2,652 (Table 12). Male faculty had higher representation in STEM compared to Non-STEM; whereas, female faculty had higher representation in Non-STEM fields compared to STEM fields in this survey.

Table 11

Faculty participation by Discipline from 2005-2012

	Survey Year								
Area of Discipline	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Total**
Humanities	859	502	389	1168	567	938	3202	2528	10153
Social Sciences	1417	502	374	1176	628	910	3118	2494	10619
Physical Sciences	464	228	161	448	254	463	1435	1098	4551
Biological Sciences	377	182	137	426	174	307	1064	951	3618
Visual & Performing Arts	593	254	178	493	227	501	1427	1246	4919
Engineering/Computer Science/Math/Statistics	1105	536	330	961	497	933	3266	2480	10108
Health & Human Ecology	448	122	111	236	104	240	1007	354	2622
Agriculture/Nat Res/Environmental Science	375	182	60	375	119	287	1199	702	3299
Business	671	300	156	583	303	627	1560	1137	5337
Education	556	205	186	594	255	464	1422	774	4456
Medical Schools & Health Professions	822	244	205	861	237	191	4324	1522	8406
Other Professions	623	221	172	479	250	446	1296	861	4348
Total	8310	3478	2459	7800	3615	6307	24320	16147	72436

Table 12

Faculty by Gender and Discipline (STEM vs. Non-STEM)

Q40 - What is your sex?			Survey Year [COACHE] 2011	Total
Male	STEM & Non STEM	STEM	3938	3938
		Non-STEM	2987	2987
		Other Professions	363	363
		Unspecified	357	357
	Total		7645	7645
Female	STEM & Non STEM	STEM	1986	1986
		Non-STEM	2652	2652
		Other Professions	309	309
		Unspecified	285	285
	Total		5232	5232

Faculty by Rank and Gender

In 2011, majority of the faculty had full-time status at their institution. Reported ranks were Instructor/Lecturer (98), Assistant Professor (3698), Associate Professor (4620), Professor (or Full Professor) (5130) and Other (37). Representation of female and male faculty (Table 13) in these categories is synonymous with the analysis from ipeds.org (i.e. Faculty in the Southeastern Land Grant Institutions in the US). Assistant Professors had almost equal male (1807) and female (1891) representation. Associate Professors had higher male (2558) faculty representation compared to female (2062) faculty. Finally, at the Professor (or Full Professor) level, male (3720) faculty had higher participation compared to female (1410) faculty. Participation of faculty in the

COACHE survey 2011 shows that there was greater participation at higher rank levels. Female faculty participation decreased at higher rank levels. There was lower female faculty participation at the Professor (or "Full Professor) rank.

Table 13

Faculty by Gender and Tenure Status

Self-reported rank [Q10/Q11]			Survey Year [COACHE] 2011	Total
Instructor/Lecturer	Q40 - What is your sex?	Male	49	49
		Female	49	49
		Total	98	98
Assistant Professor	Q40 - What is your sex?	Male	1807	1807
		Female	1891	1891
		Total	3698	3698
Associate Professor	Q40 - What is your sex?	Male	2558	2558
		Female	2062	2062
		Total	4620	4620
Professor (or "Full Professor")	Q40 - What is your sex?	Male	3720	3720
		Female	1410	1410
		Total	5130	5130
Other	Q40 - What is your sex?	Male	17	17
		Female	20	20
		Total	37	37

Faculty by Tenure Status and Gender

Tenure status of faculty is reflected in three categories: NTT (Non-Tenure Track), TT (Tenure Track), and T (Tenured). Non-Tenure Track faculty had a total of 707 participants with 380 female and 321 male. Tenure Track faculty accounted for 3,979 participants with 1,972 female and 2,007 male. Tenured faculty had the highest representation of 9,604 of which 3,460 were female and 6,144 were male. There was

equal representation by gender for Non-Tenure Track and Tenure Track faculty, but far more male faculty (64%) in the Tenured category.

Table 14

Faculty by Gender and Tenure Status

Self-reported tenure status [Q20/Q21]			Survey Year [COACHE] 2011	Total
NTT	Q40 - What is your sex?	Male	321	321
		Female	380	380
	Total		701	701
TT	Q40 - What is your sex?	Male	2007	2007
		Female	1972	1972
	Total		3979	3979
T	Q40 - What is your sex?	Male	6144	6144
		Female	3460	3460
	Total		9604	9604

Job Satisfaction/Fulfillment

These sections present the similarities and differences between STEM and Non-STEM faculty members in terms of job satisfaction/fulfillment, occupational importance and mentoring (i.e. research question 1). The sections also include the results for the second research question (What is the relationship of gender in regard to job satisfaction/fulfillment, job importance, and mentoring and STEM & Non-STEM academic mentors?). This section shows the results for research question 1 and 2 seen in all four, three, two, one or none of the criteria (discipline, gender, STEM by gender, and Non-STEM by gender).

Variables Significant in all Criteria

Table 15 displays job satisfaction and fulfillment variables statistically significant at alpha=0.05 in all four criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). The themes that fell into this category are: Nature of Work (3), Nature of Service (3), Nature of Teaching (4), Nature of Research (6), Resources & Support (5), Collaboration (2), Institutional Governance & Leadership (4), Climate (1), and Appreciation & Recognition (3).

Table 15

Significance in Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Job Satisfaction/Fulfillment		**P-values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q45B - Research - Please rate your level of satisfaction or dissatisfaction with the portion of your time spent on the following.	Nature of Work	0.000	0.000	0.000	0.000
Q45C - Service (e.g., department/program administration, faculty governance, committee work, advising/mentoring students, speaking to alumni or prospective students/parents) - Please rate your level of satisfaction or dissatisfaction with the portion of your time spent on the following.	Nature of Work	0.000	0.000	0.006	0.000
Q45E - Administrative tasks (e.g., creating and submitting reports, routine paperwork) - Please rate your level of satisfaction or dissatisfaction with the portion of your time spent on the following.	Nature of Work	0.000	0.000	0.012	0.000
Q60A - The number of committees on which you serve - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Service	0.000	0.000	0.003	0.000
Q60D - How equitably committee assignments are distributed across faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Service	0.000	0.000	0.000	0.000
Q60E - The number of students you advise/mentor (including oversight of independent study, research projects, internships, study abroad) - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Service	0.000	0.000	0.000	0.000
Q70A - The number of courses you teach - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Teaching	0.000	0.000	0.004	0.000
Q70C - The discretion you have over the content of the courses you teach - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Teaching	0.000	0.029	0.026	0.001

Table 15 Continued

Q70E - The quality of students you teach, on average - Please rate your level of satisfaction or dissatisfaction with the following.H90	Nature of Teaching	0.001	0.000	0.000	0.000
Q70H - How equitably the teaching workload is distributed across faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Teaching	0.000	0.000	0.000	0.000
Q80B - The influence you have over the focus of your research/scholarly/creative work - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Research	0.000	0.000	0.006	0.000
Q80C - The quality of graduate students to support your research/scholarly/creative work - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Research	0.000	0.000	0.007	0.001
Q85A - Obtaining externally funded grants (pre-award) - Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for.	Nature of Research	0.000	0.000	0.000	0.041
Q85B - Managing externally funded grants (post-award) - Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for.	Nature of Research	0.000	0.000	0.001	0.038
Q85C - Securing graduate student assistance - Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for.	Nature of Research	0.000	0.000	0.000	0.001
Q85E - The availability of course release time to focus on your research - Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for.	Nature of Research	0.000	0.000	0.000	0.000
Q90H - Clerical/administrative support - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources and Support	0.000	0.000	0.000	0.000
Q95C - Retirement benefits - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources and Support	0.000	0.000	0.000	0.034
Q95E - Tuition waivers, remission, or exchange - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources and Support	0.000	0.000	0.000	0.000
Q95G - Childcare - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources and Support	0.000	0.000	0.000	0.000
Q95K - Flexible workload/modified duties for parental or other family reasons - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources and Support	0.000	0.000	0.000	0.000
Q105A - Other members of your department - Please rate your level of satisfaction or dissatisfaction with your opportunities for collaboration with.	Collaboration	0.000	0.000	0.000	0.000
Q105D - Faculty outside your institution - Please rate your level of satisfaction or dissatisfaction with your opportunities for collaboration with.	Collaboration	0.000	0.000	0.000	0.000
Q180B - My institution's president's/chancellor's: Stated priorities - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.000	0.029	0.035	0.010

Table 15 Continued

Q185J - My department head's or chair's: Communication of priorities to faculty - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.000	0.003	0.010	0.020
Q185K - My department head's or chair's: Ensuring opportunities for faculty to have input into departmental policy decisions - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.000	0.000	0.002	0.001
Q185L - My department head's or chair's: Fairness in evaluating my work - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.000	0.000	0.000	0.010
Q205C - How well you fit in your department (e.g. your sense of belonging in your department) - Please rate your level of satisfaction or dissatisfaction with the following.	Climate	0.000	0.000	0.000	0.002
Q215B - Student advising - How satisfied are you with the recognition you receive for your...	Appreciation & Recognition	0.001	0.000	0.000	0.018
Q215C - Scholarly/creative work - How satisfied are you with the recognition you receive for your...	Appreciation & Recognition	0.000	0.000	0.029	0.020
Q215D - Service contributions (e.g., department/program administration, faculty governance, committee work, advising/mentoring students, speaking to alumni or prospective students/parents) - How satisfied are you with the recognition you receive for your..	Appreciation & Recognition	0.001	0.000	0.000	0.004

Variables Significant in Three Criteria

Table 16 displays job satisfaction and fulfillment variables statistically significant at alpha=0.05 in three of the criteria (i.e. in either Discipline, Gender, STEM by Gender, and Non-STEM by gender). The themes that fell into this category are: Nature of Work (2), Nature of Service (1), Nature of Teaching (4), Nature of Research (2), Resources & Support (7), Collaboration (1), Climate (2), and Appreciation & Recognition (3). Time spent on teaching; the amount of external funding faculty is expected to find; the amount of professional interaction faculty have with tenured faculty in their department; and the satisfaction with the recognition faculty receive from their colleagues/peers are the four variables not statistically significant across discipline. In terms of differences by gender, all the variables in this section were statistically significant. In this set of job

satisfaction and fulfillment variables there were 9 variables (STEM by gender) and 17 variables (Non-STEM by gender) that were statistically significantly different out of 22 in each group.

Table 16

Significance in three Criteria: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Job Satisfaction/Fulfillment		P-values			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q45A - Teaching - Please rate your level of satisfaction or dissatisfaction with the portion of your time spent on the following.	Nature of Work	0.121	0.000	0.000	0.000
Q45D - Outreach (e.g., extension, community engagement, technology transfer, economic development, K-12 education) - Please rate your level of satisfaction or dissatisfaction with the portion of your time spent on the following.	Nature of Work	0.000	0.000	0.065	0.000
Q60C - The discretion you have to choose the committees on which you serve - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Service	0.008	0.002	0.209	0.000
Q70B - The level of courses you teach - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Teaching	0.017	0.032	0.904	0.024
Q70D - The number of students in the classes you teach, on average - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Teaching	0.001	0.001	0.142	0.008
Q70I - The quality of graduate students to support your teaching - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Teaching	0.000	0.000	0.096	0.001
Q70F - The support your institution has offered you for improving your teaching - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Teaching	0.001	0.004	0.002	0.685
Q80E - The support your institution provides you for engaging undergraduates in your research/scholarly/creative work - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Research	0.045	0.000	0.226	0.000
Q80A - The amount of external funding you are expected to find - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Research	0.423	0.000	0.000	0.000
Q90B - Laboratory, research, or studio space - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.000	0.155	0.000
Q90D - Classrooms - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.000	0.422	0.000

Table 16 Continued

Q90E - Library resources - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.004	0.000	0.141
Q90F - Computing and technical support - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.004	0.099	0.002
Q90G - Salary - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.000	0.159	0.000
Q95A - Health benefits for yourself - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.038	0.000	0.955
Q95H - Eldercare - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.002	0.300	0.025
Q105E - Within your institution, faculty outside your department - Please rate your level of satisfaction or dissatisfaction with your opportunities for collaboration with.	Collaboration	0.000	0.000	0.058	0.016
Q205D - The amount of professional interaction you have with tenured faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following.	Climate	0.591	0.000	0.000	0.000
Q205E - The amount of personal interaction you have with tenured faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following.	Climate	0.000	0.006	0.094	0.002
Q215A - Teaching efforts - How satisfied are you with the recognition you receive for your...	Appreciation & Recognition	0.034	0.035	0.012	0.326
Q215E - Outreach (e.g., extension, community engagement, technology transfer, economic development, K-12 education) - How satisfied are you with the recognition you receive for your...	Appreciation & Recognition	0.002	0.000	0.011	0.053
Q215I - Your colleagues/peers - For all of your work, how satisfied are you with the recognition you receive from...	Appreciation & Recognition	0.236	0.000	0.000	0.003

Variables Significant in Two Criteria

Table 17 displays job satisfaction and fulfillment variables statistically significant at alpha=0.05 in two criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). The themes that fell into this category are: Nature of Research (2), Resources & Support (5), Institutional Governance & Leadership (3), Climate (1), and Global (1). Across these variables, there were cases in which there was a statistically significant

difference by Discipline and Gender but not within the Discipline by Gender. Or there were differences by Gender and STEM by Gender and not on the other two categories.

Table 17

Significance in Two Criteria: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Job Satisfaction/Fulfillment		P-values			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q80D - Institutional support (e.g., internal grants/seed money) for your research/scholarly/creative work - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Research	0.001	0.154	0.517	0.001
Q85D - Traveling to present papers or conduct research/creative work - Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for.	Nature of Research	0.342	0.007	0.595	0.001
Q95B - Health benefits for your family (i.e. spouse, partner, and dependents) - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.218	0.001	0.735
Q95D - Housing benefits (e.g. real estate services, subsidized housing, low-interest mortgage) - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.766	0.016	0.235
Q95F - Spousal/partner hiring program - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.041	0.362	0.242
Q95I - Phased retirement options - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.109	0.015	0.387
Q95J - Family medical/parental leave - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.027	0.793	0.057
Q180C - My institution's president's/chancellor's: Communication of priorities to faculty - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.000	0.140	0.821	0.001
Q180M - My institution's chief academic officer's (provost, VPAA, dean of faculty): Stated priorities - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.000	0.121	0.172	0.032
Q180O - My institution's chief academic officer's (provost, VPAA, dean of faculty): Ensuring opportunities for faculty to have input into the institution's priorities - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.440	0.001	0.147	0.002
Q250A - All things considered, your department as a place to work - Please rate your level of satisfaction or dissatisfaction with the following.	Climate	0.632	0.000	0.126	0.000
Q250A - All things considered, your department as a place to work - Please rate your level of satisfaction with the following.	Global	0.632	0.000	0.126	0.000

Variables Significant in One Criteria

Table 18 displays job satisfaction and fulfillment variables statistically significant at alpha=0.05 in one criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). The themes that fell into this category are: Resources & Support (2), Institutional Governance & Leadership (6), Engagement (2), Climate (1), and Global (1). The office and equipment variables were statistically significant for faculty in Non-STEM by gender. All the other variables in this group were statistically significant by Discipline but not by Gender, STEM by Gender and Non-STEM by Gender. Specifically, faculty viewed their Institutional Governance & Leadership in this group different by discipline but not by gender and within discipline by gender.

Table 18

Significance in One Criteria: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Job Satisfaction/Fulfillment		**P-values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q90A - Office - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.559	0.604	0.083	0.014
Q90C - Equipment - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.932	0.066	0.134	0.000
Q180A - My institution's president's/chancellor's: Pace of decision making - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.000	0.683	0.979	0.132
Q180L - My institution's chief academic officer's (provost, VPAA, dean of faculty): Pace of decision making - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.000	0.663	0.896	0.498
Q180N - My institution's chief academic officer's (provost, VPAA, dean of faculty): Communication of priorities to faculty - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.000	0.178	0.282	0.050
Q185E - My dean's or division head's: Stated priorities - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.005	0.799	0.086	0.475
Q185F - My dean's or division head's: Communication of priorities to faculty - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.003	0.938	0.448	0.810

Table 18 Continued

Q185I - My department head's or chair's: Stated priorities - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.001	0.056	0.132	0.064
Q195A - The intellectual vitality of tenured faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following.	Engagement	0.000	0.336	0.516	0.226
Q195C - The research/scholarly/creative productivity of tenured faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following.	Engagement	0.001	0.901	0.332	0.926
Q205B - The amount of personal interaction you have with pre-tenure faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following.	Climate	0.000	0.336	0.603	0.939
Q250B - All things considered, your institution as a place to work - Please rate your level of satisfaction or dissatisfaction with the following.	Global	0.000	0.120	0.624	0.158

Variables Not Statistically Significant

Table 19 displays job satisfaction and fulfillment variables not statistically significant at alpha=0.05 in any criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). The themes that fell into this category are: Nature of Service (1), Resources & Support (1), Institutional Governance & Leadership (2), Engagement (2) and Climate (1).

Table 19

Variables Not Statistically Significant: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Job Satisfaction/Fulfillment		**P-values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q60B - The attractiveness (e.g., value, visibility, importance, personal preference) of the committees on which you serve - Please rate your level of satisfaction or dissatisfaction with the following.	Nature of Service	0.113	0.661	0.299	0.209
Q95L - Stop-the-clock for parental or other family reasons - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.13	0.201	0.535	0.337
Q185D - My dean's or division head's: Pace of decision making - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.182	0.157	0.687	0.187

Table 19 Continued

Q185G - My dean's or division head's: Ensuring opportunities for faculty to have input into school/college priorities - Please rate your level of satisfaction or dissatisfaction with the following.	Institutional Governance & Leadership	0.136	0.117	0.743	0.119
Q195B - The intellectual vitality of pre-tenure faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following.	Engagement	0.808	0.077	0.27	0.172
Q195D - The research/scholarly/creative productivity of pre-tenured faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following	Engagement	0.242	0.285	0.906	0.245
Q205A - The amount of professional interaction you have with pre-tenure faculty in your department - Please rate your level of satisfaction or dissatisfaction with the following.	Climate	0.574	0.276	0.488	0.455

Importance

Variables Significant in all Criteria

Table 20 displays Importance variables statistically significant at alpha=0.05 in all criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). The themes that fell into this category are: Resources & Support (2) and Tenure & Promotion (6). Highlighting these differences across all four criteria shows the importance of identifying and providing support to increase the level of importance for faculty by discipline, gender, and within discipline by gender.

Table 20

Significance in Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Importance Variables		**P-Values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q95G – Childcare - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.000	0.000	0.000
Q95K – Flexible workload/modified duties for parental or other family reasons - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.000	0.000	0.000
Q135B – My department has a culture where associate professors are encouraged to work towards promotion to full professorship. Please rate your level of agreement or disagreement with the following statement	Tenure and Promotion	0.000	0.000	0.000	0.000
Q136E – My sense of whether or not I will achieve tenure - Please rate the clarity of the following aspects of earning tenure in your department.	Tenure and Promotion	0.000	0.000	0.000	0.001
Q139A – I have received consistent messages from tenured faculty about the requirements for tenure.	Tenure and Promotion	0.003	0.000	0.001	0.018
Q140A – The promotion process in my department – Please rate the clarity of the following aspects of promotion in rank from associate professor to full professor	Tenure and Promotion	0.000	0.000	0.000	0.000
Q140B – The promotion criteria (what things are evaluated in my department) - Please rate the clarity of the following aspects of promotion in rank from associate professor to full professor	Tenure and Promotion	0.001	0.000	0.000	0.000
Q140E – The time frame within which associate professors should apply for promotion - Please rate the clarity of the following aspects of promotion in rank from associate professor to full professor	Tenure and Promotion	0.000	0.000	0.000	0.000

Variables Significant in Three Criteria

Table 21 displays Importance variables statistically significant at alpha=0.05 in three criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). The themes that fell into this category are: Resources & Support (1) and Tenure & Promotion (8). In this group, all the variables were statistically significant by Gender.

Table 21

Significance in three Criteria: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Importance Variables		**P-Values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q95H – Eldercare - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.002	0.300	0.025
Q137A – A scholar – Is what's expected in order to earn tenure CLEAR to you regarding your performance as:	Tenure and Promotion	0.920	0.005	0.046	0.047
Q137C – An advisor to students – Is what's expected in order to earn tenure CLEAR to you regarding your performance as:	Tenure and Promotion	0.015	0.027	0.004	0.591
Q137D – A colleague in your department – Is what's expected in order to earn tenure CLEAR to you regarding your performance as:	Tenure and Promotion	0.000	0.017	0.001	0.494
Q138A – A scholar – Is what's expected in order to earn tenure REASONABLE to you regarding your performance as:	Tenure and Promotion	0.291	0.000	0.000	0.000
Q140C – The promotion standards (the performance thresholds) in my department - Please rate the clarity of the following aspects of promotion in rank from associate professor to full professor	Tenure and Promotion	0.267	0.000	0.000	0.000
Q140D – The body of evidence (the dossier's contents) considered in making promotion decisions - Please rate the clarity of the following aspects of promotion in rank from associate professor to full professor	Tenure and Promotion	0.052	0.000	0.000	0.000
Q140F – My sense of whether or not I will be promoted from associate to full professor - Please rate the clarity of the following aspects of promotion in rank from associate professor to full professor	Tenure and Promotion	0.945	0.000	0.000	0.000
Q145A – Have your received formal feedback on your progress toward promotion to full professor	Tenure and Promotion	0.016	0.031	0.988	0.018

Variables Significant in Two Criteria

Table 22 displays Importance variables statistically significant at alpha=0.05 in two criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). The themes that fell into this category are: Resources & Support (2) and Tenure & Promotion (6). In this group, all the variables were statistically significant by Gender.

Table 22

Significance in Two Criteria: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Importance Variables		**P-Values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q95F – Spousal/partner hiring program - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.041	0.362	0.242
Q95J – Family medical/parental leave - Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.000	0.027	0.793	0.057
Q136C – The tenure standards (the performance thresholds) in my department - Please rate the clarity of the following aspects of earning tenure in your department.	Tenure and Promotion	0.000	0.058	0.023	0.282
Q136D – The body of evidence (the dossier's contents) that will be considered in making my tenure decision - Please rate the clarity of the following aspects of earning tenure in your department.	Tenure and Promotion	0.000	0.055	0.031	0.253
Q137B – A teacher – Is what's expected in order to earn tenure REASONABLE to you regarding your performance as:	Tenure and Promotion	0.000	0.527	0.050	0.946
Q138C – An advisor to students – Is what's expected in order to earn tenure REASONABLE to you regarding your performance as:	Tenure and Promotion	0.598	0.034	0.043	0.349
Q139B – I have received consistent messages from tenured faculty about the requirements for tenure.	Tenure and Promotion	0.452	0.001	0.001	0.202
Q138B – A teacher – Is what's expected in order to earn tenure CLEAR to you regarding your performance as:	Tenure and Promotion	0.000	0.175	0.014	0.992

Variables Significant in One Criteria

Table 23 displays Importance variables statistically significant at alpha=0.05 in one criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). The theme that fell into this category is: Tenure & Promotion (5). In this group, all the variables were statistically significant by Discipline.

Table 23

Significance in One Criteria: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Importance Variables		**P-Values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q136A – The tenure process in my department – Please rate the clarity of the following aspects of earning tenure in your department.	Tenure and Promotion	0.000	0.052	0.052	0.187
Q136B – The tenure criteria (what things are evaluated) in my department - Please rate the clarity of the following aspects of earning tenure in your department.	Tenure and Promotion	0.000	0.066	0.160	0.073
Q137E – A campus citizen – Is what's expected in order to earn tenure CLEAR to you regarding your performance as:	Tenure and Promotion	0.000	0.496	0.313	0.649
Q145B – Have your received formal feedback on your progress toward tenure?	Tenure and Promotion	0.000	0.270	0.962	0.374
Q150 – When do you plan to submit your dossier for promotion to full professor?	Tenure and Promotion	0.027	0.211	0.653	0.071

Variables Not Statistically Significant

Table 23 displays Importance variables not statistically significant at alpha=0.05 in any criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). The themes that fell into this category are: Resources & Support (1), and Tenure & Promotion (4).

Table 24

Variables Not Statistically Significant: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Importance Variables		P-Values			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q95L – Stop-the-clock for parental or other family reasons- Please rate your level of satisfaction or dissatisfaction with the following aspects of your employment.	Resources & Support	0.13	0.201	0.535	0.337
Q137F – A member of the broader community (e.g., outreach) – Is what's expected in order to earn tenure CLEAR to you regarding your performance as:	Tenure and Promotion	0.87	0.57	0.548	0.861
Q138D – A colleague in your department – Is what's expected in order to earn tenure REASONABLE to you regarding your performance as:	Tenure and Promotion	0.073	0.108	0.061	0.479
Q138E – A campus citizen – Is what's expected in order to earn tenure REASONABLE to you regarding your performance as:	Tenure and Promotion	0.613	0.488	0.299	0.971
Q138F– A member of the broader community (e.g., outreach) – Is what's expected in order to earn tenure REASONABLE to you regarding your performance as:	Tenure and Promotion	0.452	0.386	0.189	0.854

Mentoring

Variables Significant in all Criteria

Table 25 displays the mentoring variables statistically significant at alpha=0.05 in all four criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). Highlighting these differences across all four criteria shows the importance of identifying and providing support to increase the level of mentoring for faculty. There were 8 mentoring variables that were statistically significant at alpha=0.05 across the four criteria.

Table 25

Significance in Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Mentoring		**P-Values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q110 - Non-tenure-track faculty in my department - At this institution and in the past five years, I have served as either a formal or informal mentor to...	Mentoring	0.003	0.000	0.000	0.000
Q120A - Having a mentor or mentors in your department - Please indicate how important or unimportant each of the following is to your success as a faculty member.	Mentoring	0.000	0.000	0.000	0.000
Q120B - Having a mentor or mentors outside your department at your institution - Please indicate how important or unimportant each of the following is to your success as a faculty member.	Mentoring	0.000	0.000	0.000	0.000
Q120C - Having a mentor or mentors outside your institution - Please indicate how important or unimportant each of the following is to your success as a faculty member.	Mentoring	0.000	0.000	0.000	0.000
Q125B - Mentoring from someone outside your department at your institution - Please rate the effectiveness or ineffectiveness of the following for you.	Mentoring	0.028	0.000	0.000	0.000
Q125C - Mentoring from someone outside your institution - Please rate the effectiveness or ineffectiveness of the following for you.	Mentoring	0.000	0.000	0.000	0.000
Q130B - There is effective mentoring of tenured associate professors in my department. - Please rate your level of agreement or disagreement with the following statements.	Mentoring	0.000	0.000	0.000	0.000
Q130C - My institution provides adequate support for faculty to be good mentors. - Please rate your level of agreement or disagreement with the following statements.	Mentoring	0.000	0.000	0.000	0.000

Variables Significant in Three Criteria

Table 26 displays the mentoring variables statistically significant at alpha=0.05 in all three criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). All the variables in this group were statistically insignificant by discipline: Faculty have served as a mentor to pre-tenure; and for non-tenure faculty; the level of agreement of being a mentor is/has been fulfilling as a faculty member; and rating the effective mentoring of pre-tenure faculty in their department.

Table 26

Significance in three Criteria: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Mentoring		**P-Values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q110 - Pre-tenure faculty outside my department - At this institution and in the past five years, I have served as either a formal or informal mentor to...	Mentoring	0.069	0.000	0.000	0.000
Q110 - Non-tenure-track faculty outside my department - At this institution and in the past five years, I have served as either a formal or informal mentor to...	Mentoring	0.400	0.000	0.000	0.005
Q115 - Would you agree or disagree that being a mentor is/has been fulfilling to you in your role as a faculty member?	Mentoring	0.401	0.000	0.043	0.001
Q130A - There is effective mentoring of pre-tenure faculty in my department. - Please rate your level of agreement or disagreement with the following statements.	Mentoring	0.452	0.000	0.000	0.004

Variables Significant in Two, One or None

Table 27 displays the mentoring variables statistically significant at alpha=0.05 in all two, one or none of the criteria (Discipline, Gender, STEM by Gender, and Non-STEM by gender). Having been a formal or informal mentor to tenured faculty in their

department differs by gender and by STEM by gender. For mentoring tenured faculty outside their department, it differs by discipline and by gender. And for faculty to mentor pre-tenured faculty in their department, it differs by discipline. The rate of effectiveness or ineffectiveness of mentoring from someone in their departments remains statistically insignificant across the four themes.

Table 27

Significance in Two or One or Not Significant in Criteria: Discipline, Gender, STEM by Gender, and Non-STEM by Gender

Mentoring		**P-Values**			
Label	**Theme**	**Discipline**	**Gender**	**STEM by Gender**	**Non-STEM by Gender**
Q110 - Tenured faculty in my department - At this institution and in the past five years, I have served as either a formal or informal mentor to...	Mentoring	0.834	0.006	0.005	0.253
Q110 - Tenured faculty outside my department - At this institution and in the past five years, I have served as either a formal or informal mentor to...	Mentoring	0.020	0.022	0.392	0.070
Q110 - Pre-tenure faculty in my department - At this institution and in the past five years, I have served as either a formal or informal mentor to...	Mentoring	0.000	0.210	0.844	0.377
Q125A - Mentoring from someone in your department - Please rate the effectiveness or ineffectiveness of the following for you.	Mentoring	0.909	0.944	0.617	0.674

Mentoring and Job Satisfaction

This section shows the results of research question 3 and 4 – What job satisfaction/fulfillment factors relate to the importance of pre-tenured faculty succeeding as a faculty member (STEM vs. Non-STEM); and which job satisfaction/fulfillment factors relate to the likelihood that tenured faculty mentor in their department? There are a total of six possible models.

STEM Tenured Faculty (Model I)

Nature of Work, Nature of Service, Nature of Teaching and Nature of Research

This model examines if there are job satisfaction and fulfillment factors influencing the odds of STEM (Science, Technology, Engineering and Mathematics) tenured faculty to mentor. 2011 data from the COACHE survey was used to examine if such factors exist. Faculty belonging to STEM fields was used for this model. Only tenured faculty were selected for this model. Only faculty, who have served as a formal or informal mentor to either pre-tenured or tenured faculty in the past five years were aggregated to form the mentoring variable. In order for faculty to be considered as a mentor in this binary category (mentoring = 1, Not Mentored 0), two variables were aggregated Q110_1 (mentoring pre-tenured faculty in their department) and/or Q110_2 (mentoring tenured faculty in their department). The mentoring variable was considered the dependent variable. Job satisfaction and fulfillment factors were selected based on faculty's nature of work, service, teaching and research. These job satisfaction and fulfillment variables were considered as the independent variables.

Logistic regression was used to validate job satisfaction and fulfillment (independent variables) factors showing the likelihood of tenured faculty to mentor (dependent

variables) pre-tenure and post-tenure faculty in STEM. There was a total of 2846 (72%) of selected cases included in the analysis. Hosmer and Lemeshow Goodness of Fit Test shows that the model is a good fit model with Chi-square Value 3.937 and a p-value (0.863) > 0.05. According to the regression model, Q80C, Q80B, and Q70E are statistically significant at p-values less than 0.05 and the independent variables in the model. These job satisfaction and fulfillment factors are selected from variables identified in either nature of work, service, teaching or research.

Independent Variables:

a.) Q70E (Please rate your level of satisfaction or dissatisfaction with the quality of student you teach, on average)

   a. The β coefficient .224 shows that one unit change in Q70E results in a .224 unit change in the log of mentoring, while taking all the other independent variables constant.
   b. This indicates that as the level of satisfaction with the quality of student faculty teaches increases, the odds of mentoring pre-tenured or tenured faculty increases by as much as 1.252 times.

b.) Q80B (Please rate your level of satisfaction or dissatisfaction with the influence you have over the focus of your research/scholarly/creative work)

   a. The β coefficient .148 shows that one unit change in Q80B results in a .148 unit change in the log of mentoring, while taking all the other independent variables constant.
   b. This indicates that as the level of satisfaction with the influence faculty have over the focus of their research/scholarly/creative work increases, the

odds of mentoring pre-tenured or tenured faculty increases by as much as 1.160 times.

c.) Q80C (Please your level of satisfaction or dissatisfaction with the quality of graduate students to support your research/scholarly/creative work)

a. The β coefficient .128 shows that one unit change in Q80C results in a .128 unit change in the log of mentoring, while taking all the other independent variables constant.

b. This indicates that as the level of satisfaction with the quality of graduate students to support faculty research/scholarly/creative work increases, the odds of mentoring pre-tenured or tenured faculty increases by as much as 1.136 times.

Table 28

Variables in the Equation (Model 1)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Q80C	.128	.043	8.804	1	.003	1.136
	Q80B	.148	.052	8.041	1	.005	1.160
	Q70E	.224	.044	25.482	1	.000	1.252
	Constant	-.894	.232	14.877	1	.000	.409

a. Variable(s) entered on step 1: Q80C, Q80B, Q70E.

STEM Tenured Faculty (Model II)

Collaboration, Resources and support, institutional governance & leadership, Climate, Appreciation & Recognition, Engagement, Global

This model examines if there are job satisfaction and fulfillment factors influencing the odds of STEM (Science, Technology, Engineering and Mathematics)

tenured faculty to mentor. 2011 data from the COACHE survey was used to examine if such factors exist. Faculty belonging to STEM fields was used for this model. Only faculty, who have served as a formal or informal mentor to either pre-tenured or tenured faculty in the past five years were selected for this model. In order for faculty to be considered as a mentor in this binary category (mentoring = 1, Not Mentored 0), two variables were aggregated Q110_1 (mentoring pre-tenured faculty in their department) and Q110_2 (mentoring tenured faculty in their department). The mentoring variable was considered the dependent variable. Job satisfaction and fulfillment factors were selected based on faculty's nature of collaboration, resources & support, institutional governance & leadership, climate, Appreciation & Recognition, Engagement and Global. These job satisfaction and fulfillment variables were considered as the independent variables.

Logistic regression was used to validate job satisfaction and fulfillment (independent variables) factors showing the likelihood of tenured faculty to mentor (dependent variables) pre-tenure and post-tenure faculty in STEM. There was a total of 713 (18%) of selected cases included in the analysis. Hosmer and Lemeshow Goodness of Fit Test shows that the model is a good fit model with Chi-square value 5.033 and a p-value (0.754) > 0.05. According to the regression model, Q90B, Q95H, Q95K and Q105E are statistically significant at p-values less than 0.05 and the independent variables in the model. These job satisfaction and fulfillment factors are selected from variables identified in either nature of collaboration, resources & support, institutional governance & leadership, climate, Appreciation & Recognition, Engagement or Global.

Independent Variables:

a.) Q90B (Please rate the level of satisfaction or dissatisfaction with the following aspects of your employment – Laboratory, research, or studio space)

   a. The β coefficient .222 shows that one unit change in Q90B results in a .222 unit change in the log of mentoring, while taking all the other independent variables constant.
   b. This indicates that as the level of satisfaction with the following aspects of faculty employment: laboratory, research, or studio space increases the odds of mentoring pre-tenured or tenured faculty increases by as much as 1.248 times.

b.) Q95H (Please rate the level of satisfaction or dissatisfaction with the following aspects of your employment – Eldercare)

   a. The β coefficient -0.390 shows that one unit change in Q95H results in a -0.390 unit change in the log of mentoring, while taking all the other independent variables constant.
   b. This indicates that as the level of satisfaction with the following aspects of faculty employment: eldercare increases the odds of mentoring pre-tenured or tenured faculty decreases by as much as 0.677 times.

c.) Q95K (Please rate the level of satisfaction or dissatisfaction with the following aspects of your employment – Flexible workload/modified duties for parental or other family reasons)

   a. The β coefficient .223 shows that one unit change in Q95K results in a .223 unit change in the log of mentoring, while taking all the other independent variables constant.

b. This indicates that as the level of satisfaction with the following aspects of faculty employment: flexible workload/modified duties for parental or other family reasons increases, the odds of mentoring pre-tenured or tenured faculty increases by as much as 1.249 times.

d.) Q105E (Please rate the level of satisfaction or dissatisfaction with your opportunities for collaboration with – within your institution, faculty outside your department)

a. The β coefficient .206 shows that one unit change in Q105E results in a .206 unit change in the log of mentoring, while taking all the other independent variables constant.

b. This indicates that as the level of satisfaction with the opportunities for collaboration with faculty institution, faculty outside your department increases the odds of mentoring pre-tenured or tenured faculty increases by as much as 1.228 times.

Table 29

Variables in the Equation (Model 2)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Q105E	.206	.089	5.296	1	.021	1.228
	Q95H	-.390	.118	10.948	1	.001	.677
	Q90B	.222	.079	7.856	1	.005	1.248
	Q95K	.223	.104	4.558	1	.033	1.249
	Constant	-.189	.400	.224	1	.636	.828

a. Variable(s) entered on step 1: Q105E, Q95H, Q90B, Q95K.

STEM Tenure Track Faculty (Model III)

Nature of Work, Nature of Service, Nature of Teaching and Nature of Research

This model examines if job satisfaction and fulfillment factors relate to the importance of having a mentor for pre-tenured faculty in order to succeed as a faculty member. 2011 data from the COACHE survey was used to examine if such factors exist. Faculty belonging to STEM fields was used for this model. Only faculty on-tenure-track were selected. Q120A (How very unimportant, unimportant, neither, important or very important having a mentor or mentors in your department is to your success as a faculty member) was selected as the dependent variable. Job satisfaction and fulfillment factors were selected based on faculty's nature of work, nature of service, nature of teaching, and nature of research. These job satisfaction and fulfillment factors were treated as the independent variables.

The dependent variable is an ordinal variable (i.e. from a scale of 1 to 5), thus ordinal regression was used to answer this question. There was a total of 1,204 out of 1,869 of the selected cases were included in the analysis. The variables that were selected for this model were Q70F, Q85B and Q85D. These job satisfaction and fulfillment factors are selected from variables identified in either nature of work, service, teaching and research. Pearson's Goodness of fit test shows that the model does not fit well with Chi-square value 653.854 with a p-value (0.000) < 0.05. Deviance has a Chi-square = 371.316 with a p-value (0.992).

Independent Variables

a. Q70F – Please rate the level of satisfaction or dissatisfaction with the support your institution has offered you for improving your teaching.

b. Q85B – Please rate the level of satisfaction or dissatisfaction with managing externally funded grants (post-award).

c. Q85D – Please rate the level of satisfaction or dissatisfaction with the support your institution has offered you for travelling to present papers or conduct research/creative work.

Table 30

Variables in the Equation (Model 3)

Plum	Command	Subtype	Label	Var1	Var2	Estimate	Std. Error	Wald	df
3	PLUM	Parameter Estimates	Parameter Estimates	Threshold	[Q120A = 1]	-5.443	0.345	248.2	1
3	PLUM	Parameter Estimates	Parameter Estimates	Threshold	[Q120A = 2]	-4.55	0.295	238.1	1
3	PLUM	Parameter Estimates	Parameter Estimates	Threshold	[Q120A = 3]	-3.525	0.269	172	1
3	PLUM	Parameter Estimates	Parameter Estimates	Threshold	[Q120A = 4]	-1.432	0.251	32.62	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85B=1]	-0.519	0.299	3.005	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85B=2]	-0.22	0.252	0.763	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85B=3]	-0.336	0.242	1.921	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85B=4]	-0.238	0.234	1.034	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85B=5]	0			0
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=1]	-0.364	0.325	1.255	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=2]	-0.396	0.246	2.594	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=3]	-0.743	0.216	11.81	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=4]	-0.447	0.209	4.569	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=5]	0			0
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85D=1]	-0.51	0.297	2.94	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85D=2]	-0.376	0.228	2.717	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85D=3]	-0.635	0.221	8.294	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85D=4]	-0.568	0.205	7.645	1
3	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85D=5]	0			0

Table 30 Continued

Var2	Sig	Lower Bound	Upper Bound	Exp_B	Lower	Upper
[Q120A = 1]	0	-6.12	-4.766	0.004	0.002	0.009
[Q120A = 2]	0	-5.128	-3.972	0.011	0.006	0.019
[Q120A = 3]	0	-4.051	-2.998	0.029	0.017	0.05
[Q120A = 4]	0	-1.924	-0.941	0.239	0.146	0.39
[Q85B=1]	0.083	-1.105	0.068	0.595	0.331	1.07
[Q85B=2]	0.382	-0.715	0.274	0.802	0.489	1.315
[Q85B=3]	0.166	-0.811	0.139	0.715	0.444	1.149
[Q85B=4]	0.309	-0.695	0.22	0.789	0.499	1.246
[Q85B=5]				1		
[Q70F=1]	0.263	-1.001	0.273	0.695	0.368	1.314
[Q70F=2]	0.107	-0.879	0.086	0.673	0.415	1.09
[Q70F=3]	0.001	-1.166	-0.319	0.476	0.312	0.727
[Q70F=4]	0.033	-0.858	-0.037	0.639	0.424	0.964
[Q70F=5]				1		
[Q85D=1]	0.086	-1.092	0.073	0.601	0.335	1.076
[Q85D=2]	0.099	-0.823	0.071	0.687	0.439	1.074
[Q85D=3]	0.004	-1.067	-0.203	0.53	0.344	0.816
[Q85D=4]	0.006	-0.971	-0.165	0.567	0.379	0.848
[Q85D=5]				1		

Non-STEM Tenured Faculty (Model IV)

Nature of Work, Nature of Service, Nature of Teaching and Nature of Research

This section examines if there are job satisfaction and fulfillment factors influencing the odds of Non-STEM (Non - Science, Technology, Engineering and Mathematics) tenured faculty to mentor. 2011 data from the COACHE survey was used to examine if such factors exist. Faculty belonging to Non-STEM fields was used for this model. Only faculty, who have served as a formal or informal mentor to either pre-tenured or tenured faculty in the past five years were selected for this model. In order for faculty to be considered as a mentor in this binary category (mentoring = 1, Not Mentored 0), two variables were aggregated Q110_1 (mentoring pre-tenured faculty in

their department) and Q110_2 (mentoring tenured faculty in their department). The mentoring variable was considered as the dependent variable. Job satisfaction and fulfillment factors were selected based on faculty's nature of work, service, teaching and research. These job satisfaction and fulfillment variables are considered the independent variables.

Logistic regression was used to validate job satisfaction and fulfillment (independent variables) factors showing the likelihood of tenured faculty to mentor (dependent variables) pre-tenure and post-tenure faculty in Non-STEM. There was a total of 3660 (87.8%) of selected cases included in the analysis. Hosmer and Lemeshow Goodness of Fit Test shows that the model is a good fit model with Chi-square value 9.988 and a p-value (0.266) > 0.05. According to the regression model, Q45E, Q70A and Q70C are statistically significant at p-values less than 0.05 and the independent variables in the model. These job satisfaction and fulfillment factors are selected from variables identified in either nature of work, service, teaching and research.

Independent Variables:

a.) Q45E (Please rate your level of satisfaction or dissatisfaction with the portion of your time spent on administrative tasks (e.g. creating and submitting reports, routine paperwork)

    a. The β coefficient -0.119 shows that one unit change in Q45E results in a -0.119 unit change in the log of mentoring, while taking all the other independent variables constant.

b. This indicates that as the level of satisfaction with the portion of time spent on administrative tasks increases the odds of mentoring pre-tenured or tenured faculty decreases by as much as 0.888 times.

b.) Q70A (Please rate your level of satisfaction or dissatisfaction with the number of courses you teach).

a. The β coefficient 0.105 shows that one unit change in Q70A results in a 0.101 unit change in the log of mentoring, while taking all the other independent variables constant.

b. This indicates that as the level of satisfaction with the number of courses faculty teach increases the odds of mentoring pre-tenured or tenured faculty increases by as much as 1.111 times.

c.) Q70C (Please rate your level of satisfaction or dissatisfaction with the discretion you have over the content of the courses you teach)

a. The β coefficient 0.160 shows that one unit change in Q70C results in a 0.160 unit change in the log of mentoring, while taking all the other independent variables constant.

b. This indicates that as the level of satisfaction with the discretion faculty have over the content of their courses they teach increases the odds of mentoring pre-tenured or tenured faculty increases by as much as 1.174 times.

Table 31

Variables in the Equation (Model 4)

Variables in the Equation

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	Q45E	-.119	.037	10.310	1	.001	.888
	Q70A	.105	.036	8.424	1	.004	1.111
	Q70C	.160	.052	9.459	1	.002	1.174
	Constant	.320	.240	1.786	1	.181	1.377

a. Variable(s) entered on step 1: Q45E, Q70A, Q70C.

Non-STEM Tenured Faculty (Model V)

Collaboration, Resources and support, institutional governance & leadership, Climate, Appreciation & Recognition, Engagement, Global

This section examines if there are job satisfaction and fulfillment factors influencing the odds of Non-STEM (Non - Science, Technology, Engineering and Mathematics) tenured faculty to mentor. 2011 data from the COACHE survey was used to examine if such factors exist. Faculty belonging to Non-STEM fields was used for this model. Only faculty, who have served as a formal or informal mentor to either pre-tenured or tenured faculty in the past five years were selected for this model. In order for faculty to be considered as a mentor in this binary category (mentoring = 1, Not Mentored 0), two variables were aggregated Q110_1 (mentoring pre-tenured faculty in their department) and Q110_2 (mentoring tenured faculty in their department). The mentoring variable was considered the dependent variable. Job satisfaction and fulfillment factors were selected based on faculty's nature of collaboration, resources & support, institutional governance & leadership, climate, Appreciation & Recognition,

Engagement and Global. These job satisfaction and fulfillment variables were considered the independent variables.

Logistic regression was used to validate job satisfaction and fulfillment (independent variables) factors showing the likelihood of tenured faculty to mentor (dependent variables) pre-tenure and post-tenure faculty in Non-STEM. There was a total of 3903 (93.7%) of selected cases included in the analysis. None of the job satisfaction and fulfillment variables were selected to complete a logistic regression model for this case.

Table 32

Variable in the Equation (Model 5)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Q90H	.014	.030	.218	1	.641	1.014
	Constant	1.003	.105	91.965	1	.000	2.725

a. Variable(s) entered on step 1: Q90H.

Non-STEM Tenure Track Faculty (Model VI)

Nature of Work, Nature of Service, Nature of Teaching and Nature of Research

This model examines if job satisfaction and fulfillment factors relate to the importance of having a mentor for pre-tenured faculty in order to succeed as a faculty member. 2011 data from the COACHE survey was used to examine if such factors exist. Faculty belonging to Non-STEM fields was used for this model. Only faculty on-tenure-track were selected for this model. Q120A (How very unimportant, unimportant, neither, important or very important having a mentor or mentors in your department is to your

success as a faculty member) was selected as the dependent variable. Job satisfaction and fulfillment factors were selected based on faculty's nature of work, nature of service, nature of teaching, and nature of research. These job satisfaction and fulfillment factors were treated as the independent variables.

The dependent variable is an ordinal variable (i.e. from a scale of 1 to 5), thus ordinal regression was used to answer this question. There was a total of 2,270 out of 4,200 of the selected cases were included in the analysis. The variables that were selected for this model were Q45A, Q70E, Q70F, Q85A, and Q85C. These job satisfaction and fulfillment factors are selected from variables identified in either nature of work, service, teaching and research. Pearson's Goodness of Fit Test shows that the model does not fit well with Chi-square value 4520.595 with a p-value (0.000) < 0.05. Deviance has a Chi-square = 1982.935 with a p-value (1).

Independent Variables

a. Q45A – Please rate the level of satisfaction or dissatisfaction with the portion of your time spent on teaching.

b. Q70E – Please rate your level of satisfaction or dissatisfaction with the quality of student you teach, on average.

c. Q70F – Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for improving your teaching.

d. Q85A – Please rate your level of satisfaction or dissatisfaction with the support your institution has for obtaining externally funded grants (pre-award).

e. Q85C – Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for securing graduate student assistance.

Table 33

Variables in the Equation (Model 6)

	Command	Subtype	Label	Var1	Var2	Estimate	Std. Error	Wald	df
2	PLUM	Parameter Estimates	Parameter Estimates	Threshold	[Q120A = 1]	-5.85	0.293	399.261	1
2	PLUM	Parameter Estimates	Parameter Estimates	Threshold	[Q120A = 2]	-4.649	0.241	373.186	1
2	PLUM	Parameter Estimates	Parameter Estimates	Threshold	[Q120A = 3]	-3.567	0.223	255.434	1
2	PLUM	Parameter Estimates	Parameter Estimates	Threshold	[Q120A = 4]	-1.478	0.212	48.657	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q45A=1]	0.226	0.348	0.423	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q45A=2]	-0.249	0.167	2.222	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q45A=3]	-0.121	0.161	0.56	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q45A=4]	-0.345	0.12	8.249	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q45A=5]	0			0
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70E=1]	-0.311	0.256	1.47	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70E=2]	-0.279	0.164	2.87	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70E=3]	-0.302	0.153	3.901	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70E=4]	0.01	0.138	0.005	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70E=5]	0			0
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85A=1]	-0.123	0.215	0.329	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85A=2]	-0.107	0.169	0.398	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85A=3]	-0.451	0.159	8.029	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85A=4]	-0.353	0.153	5.298	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85A=5]	0			0
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85C=1]	-0.071	0.244	0.084	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85C=2]	-0.489	0.217	5.09	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85C=3]	-0.399	0.211	3.57	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85C=4]	-0.227	0.209	1.178	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q85C=5]	0			0
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=1]	-0.234	0.237	0.97	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=2]	-0.388	0.181	4.597	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=3]	-0.512	0.158	10.551	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=4]	-0.348	0.15	5.4	1
2	PLUM	Parameter Estimates	Parameter Estimates	Location	[Q70F=5]	0			0

Table 33 Continued

Var2	Sig	Lower Bound	Upper Bound	Exp_B	Lower	Upper
[Q120A = 1]	0	-6.424	-5.276	0.003	0.002	0.005
[Q120A = 2]	0	-5.121	-4.177	0.01	0.006	0.015
[Q120A = 3]	0	-4.005	-3.13	0.028	0.018	0.044
[Q120A = 4]	0	-1.893	-1.063	0.228	0.151	0.345
[Q45A=1]	0.516	-0.456	0.909	1.254	0.634	2.482
[Q45A=2]	0.136	-0.576	0.078	0.78	0.562	1.082
[Q45A=3]	0.454	-0.437	0.196	0.886	0.646	1.216
[Q45A=4]	0.004	-0.581	-0.11	0.708	0.559	0.896
[Q45A=5]				1		
[Q70E=1]	0.225	-0.813	0.192	0.733	0.443	1.211
[Q70E=2]	0.09	-0.601	0.044	0.757	0.548	1.045
[Q70E=3]	0.048	-0.602	-0.002	0.739	0.548	0.998
[Q70E=4]	0.945	-0.261	0.281	1.01	0.77	1.324
[Q70E=5]				1		
[Q85A=1]	0.566	-0.544	0.297	0.884	0.581	1.346
[Q85A=2]	0.528	-0.438	0.225	0.899	0.645	1.252
[Q85A=3]	0.005	-0.764	-0.139	0.637	0.466	0.87
[Q85A=4]	0.021	-0.654	-0.052	0.702	0.52	0.949
[Q85A=5]				1		
[Q85C=1]	0.772	-0.548	0.407	0.932	0.578	1.503
[Q85C=2]	0.024	-0.914	-0.064	0.613	0.401	0.938
[Q85C=3]	0.059	-0.814	0.015	0.671	0.443	1.015
[Q85C=4]	0.278	-0.636	0.183	0.797	0.529	1.2
[Q85C=5]				1		
[Q70F=1]	0.325	-0.699	0.231	0.792	0.497	1.26
[Q70F=2]	0.032	-0.743	-0.033	0.678	0.476	0.967
[Q70F=3]	0.001	-0.821	-0.203	0.599	0.44	0.816
[Q70F=4]	0.02	-0.641	-0.054	0.706	0.527	0.947
[Q70F=5]				1		

Summary

This chapter shows the results of the 2011 COACHE data geared towards faculty in higher education. The results are shown in five separate sections addressing the four research questions. The first section addresses faculty demographics in this survey. It allots the total number of faculty, who participated in the 2011 COACHE survey by gender, rank, tenure status, and type of discipline (STEM vs. Non-STEM). The second, third and forth sections highlights for differences (i.e. if any) for factors relating to job satisfaction/fulfillment, importance and mentoring of faculty by discipline, gender, and within discipline by gender. The last section entails six possible regression models geared towards mentoring and job satisfaction of faculty by type of discipline (STEM and Non-STEM) and tenure status (tenured and on-tenure track).

In this analysis, there was higher representation of Non-STEM faculty compared to STEM faculty by gender, tenure status and rank. In terms of job satisfaction/fulfillment, importance and mentoring there were numerous variables that were statistically significantly different across the four criteria (discipline, gender, STEM by gender, Non-STEM by gender). Finally, the six regression models highlight the importance of job satisfaction/fulfillment factors to mentoring of STEM or Non-STEM faculty by tenure status. These findings, conclusions and recommendations are discussed in more detail in the following chapter.

CHAPTER 5: CONCLUSION

Introduction

This chapter presents the conclusion, summary and recommendation of this study. The conclusion is presented with each of the four research questions along with the conclusion of their findings. The findings of the first research question show the factors/variables grouped into 11 specific areas of faculty job satisfaction/fulfillment, job importance and mentoring; and presented the results relating to significance (i.e. if there were statistically significant) of the factors. Likewise, these same 11 area relating to job satisfaction/fulfillment, job importance, and mentoring factors were grouped and compared to see which factors were statistically significantly different by gender, STEM by gender and Non-STEM by gender.

The findings for the third research question compare models 3 (STEM faculty) and 6 (Non-STEM faculty). It shows the differences and similarities of job satisfaction/fulfillment (i.e. nature of work, nature of service, nature of teaching, and nature of research) factors associated with pre-tenured faculty's vision of seeing mentoring (i.e. having a formal or informal mentor) as an influential option towards the success as an academic. Similarly, the fourth research question presents and compares the findings on models 1 (STEM) & 4 (Non-STEM), and models 2 (STEM) & 5 (Non-STEM). These models presented job satisfaction/fulfillment factors associated with tenured faculty having mentored on-tenure track and/or tenured faculty in their

department. The rest of the chapter presents an entire summary of the study, followed by the recommendations for future study.

Purpose of Study

The purpose of this study was to examine faculty's job satisfaction/fulfillment, job importance and mentoring by gender and type of discipline (STEM vs. Non-STEM) using the 2011 Collaborative on Academic Careers in Higher Education (COACHE) survey. "(COACHE) is a Harvard-based consortium of institutional leaders who are taking cost-effective steps to improve outcomes in faculty recruitment, development, and retention." (http://sites.gse.harvard.edu/coache) This discussion section adds to a growing body of literature on recruitment and retention of faculty in STEM particularly the differences these faculty encounter in job satisfaction/fulfillment and mentoring to Non-STEM faculty. This study also examined job satisfaction factors influencing faculty being mentored and those mentoring in STEM and Non-STEM fields.

Research Questions

Research Question 1

1. To what extent is there a difference between STEM and Non-STEM faculty members in terms of job satisfaction/fulfillment, occupational importance and mentoring?

Job Satisfaction/Fulfillment Variables - Findings

This section had a total of 11 different areas of faculty's job satisfaction/fulfillment. These 11 areas are Nature of Work, Nature of Service, Nature of Teaching, Nature of Research, Resources & Support, Collaboration, Institutional

Governance & Leadership, Climate, Appreciation & Recognition, Global, and Engagement. There were 84 factors/variables associated with job satisfaction/fulfillment variables. The findings for the job satisfaction/fulfillment factors show if there was a significant difference by discipline (STEM vs. Non-STEM). The table below summarized the number of factors that differed by discipline (STEM vs. Non-STEM).

Table 34

Job Satisfaction/Fulfillment variables similar and different by discipline (STEM vs. Non-STEM)

Job Satisfaction/Fulfillment	Discipline		
Area	Sign.	Not Sign.	Total
Nature of Work	4	1	5
Nature of Service	4	1	5
Nature of Teaching	8	0	8
Nature of Research	9	1	10
Resources & Support	17	3	20
Collaboration	3	0	3
Institutional Governance & Leadership	12	3	15
Climate	3	3	6
Appreciation & Recognition	5	1	6
Global	1	1	2
Engagement	2	2	4

Nature of Work

There were 5 factors associated with faculty's nature of work. Four out of the five factors were statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with the portion of time spent with research; service (e.g., department/program administration, faculty governance, committee work, advising/mentoring students, speaking to alumni or prospective students/parents);

administrative tasks (e.g., creating and submitting reports, routine paperwork); and outreach (extension, community engagement, technology, transfer economic development, K-12 education). The last factor in the Nature of Work category was associated with the level of satisfaction with faculty's time spent on teaching differed by discipline.

Nature of Service

There were 5 factors associated with faculty's nature of service. Four out of the five factors were statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with the number of committee on which they serve; how equitably committee assignments are distributed across faculty in their department; the number of students they advise/mentor (including oversight of independent study, research, projects, internships, study abroad); and the discretion you have to choose the committees on which you serve. The level of satisfaction with the attractiveness (e.g. value, visibility, importance, personal preference) of the committees on which they serve does not differ by discipline (STEM vs. Non-STEM).

Nature of Teaching

There were 8 factors associated with faculty's nature of teaching. All eight factors were statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with the number of courses they teach; the discretion they have over the content of the courses they teach; the quality of students they teach, on average; how equitably the teaching workload is distributed across faculty in their department; the

level of courses they teach; the number of students in the classes they teach, on average; the quality of students to support their teaching; and the support their institution has offered them for improving their teaching.

Nature of Research

There were 10 factors associated with faculty's nature of research. Eight out of the 10 factors were statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with the influence faculty have over the focus of their research/scholarly/creative work; the quality of graduate students to support their research/scholarly/creative work; the support their institution has offered for obtaining externally funded grants (pre-award); the support their institution has offered for managing externally funded grants (post-award); the support their institution has offered for securing graduate student assistance; the support their institution has offered for the availability of course release time to focus on their research; and the support their institution provides them for engaging undergraduates in their research/scholarly/creative work and institutional support (e.g., internal grants/seed money). There were only two factors that were not statistically significant by discipline: the amount of external funding they are expected to find; and the support their institution had offered for traveling to present papers or conduct research/creative work.

Resources & Support

There were 20 factors associated with resources & support. Seventeen out of the 20 factors were statistically significant by discipline. Both STEM and Non-STEM faculty

differ by the level of satisfaction with the clerical/administrative support; retirement benefits; tuition waivers, remission, or exchange; childcare; flexible workload/modified duties for parental or other family reasons; laboratory, research, or studio space; classrooms; library resources; computing and technical support; salary; health benefits for themselves; eldercare; health benefits for their family (i.e. spouse, partner, ad dependents); housing benefits (e.g., real estate services, subsidized housing, low-interest mortgage); spousal/partner hiring program; phased retirement options; and family medical/parental leave. There were only three factors that were not statistically significant by discipline: the level of satisfaction with office; equipment; and stop-the-clock for parental or other family reasons.

Collaboration

There were 3 factors associated with collaboration. All of the 3 factors were statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with the opportunities for collaboration with other members of their department; faculty outside their institution; and within their institution, faculty outside their department.

Institutional Governance & Leadership

There were 15 factors associated with institutional governance & leadership. Twelve out of the 15 factors were statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with their institution's president/chancellor's: stated priorities; their department head's or chair's:

communication of priorities to faculty; their department head's or chair's: ensuring opportunities for faculty to have input into departmental policy decisions; their department head's or chair's: fairness in evaluating their work; their institution's president's/chancellor's: communication of priorities to faculty; their institution's chief academic officer's: stated priorities; their institution's president/chancellor's: pace of decision making; their institution's chief academic officer: pace of decision making; their institution's chief academic officer: communication of priorities to faculty; their dean's or division head's: stated priorities; their dean's or division head's: communication of priorities to faculty; and their department head's or chair's: stated priorities.

There were three factors that were not statistically significant by discipline: the level of satisfaction with their institution's chief academic officer: ensuring opportunities for faculty to have input into the institution's priorities; their dean's or division head's: pace of decision making; and their dean's or division head's: ensuring opportunities for faculty to have input into school/college priorities.

Climate

There were 3 factors associated with climate. All of the 3 factors were statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with how well faculty fit in their department; the professional interaction they have with tenured faculty in their department; and the amount of personal interaction they have with tenured faculty in their department.

Appreciation & Recognition

There were 6 factors associated with appreciation & recognition. Five out of the 6 factors were statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with the recognition they receive for advising; scholarly/creative work; service contributions; teaching efforts; and outreach. There was only 1 factor that was not statistically significant by discipline: the level of satisfaction with the recognition they receive from their colleagues/peers.

Global

There were 2 factors associated with global. One factor was statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with the their institution as a place to work, all things considered. The other factor was not statistically significant by discipline: the level of satisfaction with their department as a place to work, all things considered.

Engagement

There were 4 factors associated with engagement. Two out of the 4 factors were statistically significant by discipline. Both STEM and Non-STEM faculty differ by the level of satisfaction with the intellectual vitality of tenured faculty in their department; and the research/scholarly/creative productivity of tenured faculty in their department. The other two factors were not statistically significant by discipline: the level of satisfaction the intellectual vitality of pre-tenure faculty in their department; and the research/scholarly/creative productivity of pre-tenured faculty in their department.

Job Importance and Mentoring Variables – Findings

This section had a total of 2 different areas of job importance and 1 area for mentoring. The areas linked with Job Importance are Resources & Support, and Tenure & Promotion. There were a total of 35 variables in reference with job importance. The findings for the job importance factors shows whether there were significant difference by discipline. The table below summarized the number of factors that differ by discipline.

Table 35

Job Importance variables similar and different by discipline

Job Importance	**Discipline**		
Area	**Sign.**	**Not Sign.**	**Total**
Resources & Support	5	1	6
Tenure & Promotion	18	11	29

Resources & Support

There were 6 factors associated with Resources & Support. Five out of the 6 factors are statistically significant by discipline – Level of satisfaction with childcare; flexible workload/modified duties for parental or other family reasons; eldercare; spousal/partner hiring program; and family medical/parental leave. The only factor that was not statistically significant by discipline was the level of satisfaction with stop-the-clock for parental or other family reasons.

Tenure & Promotion

Tenure & Promotion had 29 factors pertaining to a very important aspect of faculty's job. There were 18 out of the 29 factors that were statistically significant by discipline:

- The clarity of the following aspects of promotion in rank from associate professor to full professor – the promotion process in my department; the promotion criteria (what things are evaluated in my department); and the time frame within which associate professors should apply for promotion.
- The clarity with their sense of whether or not I will achieve tenure; the tenure standards (the performance thresholds) in their department; the body of evidence (the dossier's contents) that will be considered in making my tenure decision; the tenure process in their department; the tenure criteria (what things are evaluated) in their department.
- Level of agreement with whether their department has a culture where associate professors are encouraged to work towards promotion to full professors.
- Received formal feedback on their progress toward promotion to full professor.
- Is what is expected to earn tenure clear to their performance as an advisor to students; a teacher; a campus citizen; and a colleague in their department?
- Is what is expected in order to earn tenure reasonable to you regarding their performance as a teacher?
- Receiving formal feedback on their progress toward tenure, and the timeframe to submit their dossier for promotion to full professor.

Lastly, there were 11 factors that were not statistically significant by discipline (STEM vs. Non-STEM):

- The clarity of the following aspects of promotion in rank from associate professor to full professor –

- The promotion standards (the performance thresholds) in my department; the body of evidence (the dossier contents) considered in making promotion decisions; and their sense of whether or not they will be promoted from associate to full professor
- The expectation in order to earn tenure reasonable to their performance as a scholar; an advisor to students; a colleague in their department; a campus citizen; and a member of the broader community.
- Is what's expected in order to earn tenure clear regarding their performance as a scholar; and a member of the broader community (e.g. outreach)?
- Received consistent messages from tenured faculty about the requirements for tenure.

Mentoring Variables – Findings

This section had a total of 16 variables/factors in reference with mentoring. The findings for mentoring factors show if there was a significant difference by discipline (STEM vs. Non-STEM). The table below summarized the number of factors that differ by discipline.

Table 36

Mentoring variables similar and different by discipline

Mentoring	Discipline		
Area	Sign.	Not Sign.	Total
Mentoring	10	6	16

Ten out of the 16 factors were statistically significantly different by discipline:

- Please indicate how important or unimportant each of the following is to your success as a faculty member – Having a mentor or mentors in your department; having a mentor or mentors outside your department at your institution; and having a mentor or mentors outside your institution.
- Please rate the effectiveness or ineffectiveness of the following for you – mentoring from someone outside your department at your institution; and mentoring from someone outside your institution.
- Level of agreement or disagreement with – there is effective mentoring of tenured associate professors in my department; my institution provides adequate support for faculty to be good mentors.
- At this institution and in the past five years, I have served as either a formal or informal mentor to - Non-tenure track faculty in my department; pre-tenured faculty outside my department; and pre-tenured faculty in my department.

The last 6 factors were not statistically significant by discipline. At their institution faculty was asked if they have served as either a formal or informal mentor to pre-tenured faculty outside my department; non-tenured-track faculty outside my department; and tenured faculty in my department were not different by discipline. Similarly, the level of agreement for being a mentor is/has been fulfilling to you in your role as a faculty member; effective mentoring of pre-tenured faculty in my department; and the effectiveness of mentoring from someone in your department were factors that were not statistically significantly different by STEM and Non-STEM faculty.

Research Question 2

2. What is the relationship of gender in regard to job satisfaction/fulfillment, job importance, and mentoring and STEM & Non-STEM academic mentors?

Job Satisfaction/Fulfillment Variables - Findings

This section had a total of 11 different areas of faculty's job satisfaction/fulfillment. These 11 areas are Nature of Work, Nature of Service, Nature of Teaching, Nature of Research, Resources & Support, Collaboration, Institutional Governance & Leadership, Climate, Appreciation & Recognition, Global, and Engagement. There were factors/variables associated with each of these areas. The findings for the job satisfaction/fulfillment factors shows if there were significant difference by gender and within discipline (STEM vs. Non-STEM) if there were significant differences by gender. The table below summarized the number of factors that differ by gender, STEM by gender, and Non-STEM by gender.

Table 37

Job Satisfaction/Fulfillment variables similar and different by gender and within discipline by gender.

Job Satisfaction	Gender			STEM			Non-STEM		
Area	Sign.	Not Sign.	Total	Sign.	Not Sign.	Total	Sign.	Not Sign.	Total
Nature of Work	5	0	5	4	1	5	5	0	5
Nature of Service	4	1	5	3	2	5	4	1	5
Nature of Teaching	8	0	8	5	3	8	7	1	8
Nature of Research	9	1	10	7	3	10	10	0	10
Resources & Support	14	6	20	10	10	20	12	8	20
Collaboration	3	0	3	2	1	3	3	0	3
Institutional Governance & Leadership	5	10	15	4	11	15	7	8	15
Climate	4	2	6	2	4	6	4	2	6
Appreciation & Recognition	6	0	6	6	0	6	4	2	6
Global	1	1	2	0	2	2	1	1	2
Engagement	0	4	4	0	4	4	0	4	4

Nature of Work

There were 5 factors in the area – Nature of Work. The level of satisfaction with the portion of time spent on research, service, administration, teaching and outreach is significantly different by gender. For faculty in Non-STEM fields the same results apply. STEM faculty have similar results with the exception of their level of satisfaction on outreach (not statistically significant by gender).

Nature of Service

Nature of Service has 5 factors in this area. Three out of these 5 factors are significantly different by gender and within both disciplines by gender (level of satisfaction with the number of committee members on which they serve; how equitably committee assignments are distributed across faculty in your department; and the number of students they advise/mentor). In terms of the level of satisfaction with the discretion they have to choose the committees they serve varies significantly different by gender and for faculty by gender in Non-STEM disciplines. The only factor that is not significantly different in the three parameters (gender, STEM by gender and Non-STEM by gender) is the attractiveness of the committees they serve.

Nature of Teaching

In the area of Nature of Teaching, there were 8 factors. The level of satisfaction on the number of courses they teach; the discretion they have over the content of the courses they teach; the quality of students they teach (on average); and how equitably the teaching workload is distributed across faculty in your department varies statistically

significant by gender, STEM by gender and Non-STEM by gender. Male and female faculty report a statistically significant difference on the level of satisfaction on the level of courses they teach; the number of students in the classes they teach (on average); and the quality of students to support teaching. Similarly, male and female Non-STEM faculty compared to STEM faculty differs in the three previous factors. Finally, on the level of satisfaction with the support their institution has offered for improving their teaching statistically significantly differ by male and female, male and female faculty in STEM but not by Non-STEM faculty by gender.

Nature of Research

Seven out of 10 factors in this area were statistically significantly different by gender, STEM by gender and Non-STEM by gender – The satisfaction level with the influence faculty has over the focus of their research/scholarly/creative work; the quality of students to support your research/scholarly/creative work; obtaining externally funded grants (pre-award); managing externally funded grants (post-award); securing graduate student assistance; the availability of course release time to focus on your research and the amount of external funding they are expected to find. Male and female faculty in general and faculty in Non-STEM statistically significantly differ with the level of satisfaction with the support their institution provides for engaging undergraduates in your research/scholarly/creative work. There is no difference with female and male faculty in STEM with the previous factor. In terms of the level of satisfaction with institutional support for their research/scholarly/creative work statistically significantly differs only with male and female faculty in Non-STEM disciplines. Lastly, there is no

statistically significant difference with only male and female faculty in STEM disciplines with the level of satisfaction to travel to present papers or conduct research/creative work.

Resources & Support

There are 20 factors associated with Resources & Support. Five out of the 20 factors are statistically significant by gender, STEM by gender, and Non-STEM by gender – Level of satisfaction with clerical/administrative support; retirement benefits; tuition waivers, remission, or exchange; childcare; flexible workload/modified duties for parental or other family reasons. Male and female faculty in general and non-STEM but not in STEM disciplines statistically significantly differ with the level of satisfaction with the following aspect of their employment - laboratory, research, or studio space; classrooms; computing and technical support; salary; and eldercare. Following, library resources; and health benefits for faculty differ by gender and by male and female faculty only in STEM disciplines.

Health benefits for your family; housing benefits; phased retirement options are only statistically significantly different by gender in STEM disciplines. On-the-other-hand office and equipment factors differ by female and male faculty in Non-STEM disciplines. Whereas, spousal/partner hiring program; and family medical/parental leave is statistically significantly different only by gender. Lastly, stop-the-clock for parental or other family reasons does not differ across faculty by gender, STEM by gender, and Non-STEM by gender.

Collaboration

There were 3 factors associated with faculty Collaboration. Two out of 3 of the factors (level of satisfaction with the collaboration with opportunities for collaboration with other members of their department; and faculty outside their institution) were statistically significant by gender and within discipline (STEM and Non-STEM) by gender. As opportunities for collaboration within their institution – faculty outside their department both men and women in general differ and within Non-STEM faculty.

Institutional Governance & Leadership

In the area of Institutional Governance & Leadership there were 15 factors. Eight out of 15 were not statistically significantly different by gender and within discipline (STEM vs. Non-STEM) by gender – level of satisfaction with the institution's president's/chancellor': pace of decision making; institution's chief academic officer's (provost, VPAA, dean of faculty); institution's chief academic officer's: communication of priorities to faculty; their dean's or division head's: stated priorities; their dean's or division head's: communication of priorities to faculty; their department head's or chair's: stated priorities; their dean's or division head's: pace of decision making; and their dean's or division head's: ensuring opportunities for faculty to have input into school/college priorities.

On-the-other-hand, there were four factors that were statistically significant by gender and within discipline by gender – the level of satisfaction their institution's president/chancellor's: stated priorities; their department head's or chair's: communication of priorities to faculty; their department head's or chair's: ensuring

opportunities for faculty to have input into departmental policy decisions; and their department head's or chair's: fairness in evaluating my work. Following, at their institution's president's/chancellor's: communication of priorities to faculty; and at their institution's chief academic officer's: stated priorities statistically significantly differ only by male and female faculty in Non-STEM. Finally, at their institution's chief academic officer's: ensuring opportunities for faculty to have input into the institution's priorities was statistically significant by gender and for Non-STEM faculty by gender.

Climate

Female and male faculty in general, in STEM and Non-STEM disciplines statistically significantly differ by how well they fit in their department; and the amount of professional interaction they have with tenured faculty in their department. Compared to the level of satisfaction on the amount of personal interaction they have with tenured faculty in the department; and all things considered, their department as a place to work statistically significantly differs by gender and within Non-STEM by gender. The last two variables in this area (the satisfaction level with the amount of personal interaction they have with pre-tenured faculty in their department; and the amount of professional interaction they have with pre-tenured faculty in their department) do not differ by male and female faculty in general and discipline (STEM vs. Non-STEM) by gender.

Appreciation & Recognition

There were 6 factors in this area. Four of these factors were statistically significantly different by gender and within STEM and Non-STEM by gender – level of satisfaction

with student advising; scholarly/creative work; service contributions; and for all their work their level of satisfaction with the recognition received from their colleagues/peers. Female and male faculty statistically significantly differ with the satisfaction level with the recognition they receive for their teaching efforts; and outreach. Only STEM female and male faculty differ with the last two factors compared to female and male faculty in Non-STEM.

Global

The area of Global had two factors. The level of satisfaction with all things considered, their department as a place to work statistically significantly differs by gender and within Non-STEM faculty by gender. The other factor (level of satisfaction with their institution as a pace to work) does not differ by gender and within the disciplines (STEM vs. Non-STEM) by gender.

Engagement

All the 4 factors in this area were not statistically significantly different by gender and within discipline (STEM vs. Non-STEM) by gender – level of satisfaction with the research/scholarly/creative productivity of tenured faculty in your department; the intellectual vitality of tenured faculty in your department; the intellectual vitality of pre-tenured faculty in your department; and the research/scholarly/creative productivity of pre-tenured faculty in your department.

Job Importance and Mentoring Variables – Findings

This section had a total of 2 different areas of job importance and 1 area for mentoring. The areas linked with Job Importance are Resources & Support, and Tenure

& Promotion. There were a total of 35 variables in reference with job importance. The findings for the job importance factors shows there were significant difference by gender and within discipline (STEM vs. Non-STEM) if there were significant differences by gender. The table below summarized the number of factors that differ by gender, STEM by gender, and Non-STEM by gender.

Table 38

Job Importance variables similar and different by gender and within discipline by gender.

Job Importance	Gender			STEM			Non-STEM		
Area	Sign.	Not Sign.	Total	Sign.	Not Sign.	Total	Sign.	Not Sign.	Total
Resources & Support	5	1	6	2	4	6	3	3	6
Tenure & Promotion	16	13	29	18	11	29	12	17	29

Resources & Support

There were 6 factors associated with Resources & Support. Two out of the 6 factors are statistically significant by gender, STEM by gender, and Non-STEM by gender – Level of satisfaction with childcare; and flexible workload/modified duties for parental or other family reasons. Female and male faculty in general and Non-STEM faculty by gender statistically significantly differ with the level of satisfaction for eldercare. The satisfaction level of spousal/partner hiring program; and family medical/parental leave differs only by gender. Lastly, the stop-the-clock for parental or other family reasons factor was not statistically significantly different by gender, STEM by gender and Non-STEM by gender.

Tenure & Promotion

Tenure & Promotion had 29 factors pertaining to a very important aspect of faculty's job. There were 11 out of the 29 factors that were statistically significant by gender, STEM by gender, and Non-STEM by gender:

- Please rate the clarity of the following aspects of promotion in rank from associate professor to full professor.
    - The promotion process in their department; the promotion criteria (what things are evaluated in my department); the time frame within which associate professors should apply for promotion; the promotion standards (the performance thresholds) in their department; the body of evidence (the dossier's contents) considered in making promotion decisions; and their sense of whether or not they will be promoted from associate to full professor.
- The level of agreement with their department has a culture where associate professors are encouraged to work towards promotion to full professorship.
- The clarity of the whether or not they will achieve tenure in their department.
- They have received consistent messages from tenured faculty about the requirements for tenure.
- Is what is expected in order to earn tenure reasonable to regarding their performance as a scholar?
- Is what's expected in order to earn tenure clear regarding their performance as a scholar?

In terms of what's expected in order to earn tenure clear regarding their performance as an advisor to students; a colleague in their department; along with having received consistent messages from tenured faculty about the requirements for tenure; and the expectation as an advisor to students as being reasonable to earn tenure varied statistically significantly different by gender and within STEM female and male faculty only. Following, the rate of clarity for earning tenure in their department with the body of evidence that will be considered in making their tenure decision; and the tenure status in their department only differs statistically significantly by female and male in STEM disciplines. The same conclusion is derived for the expectation to earn tenure clear to faculty regarding their performance as a teacher. And, female and male faculty in general and in Non-STEM statistically significantly differ with having received formal feedback on their progress toward promotion to full professor.

The rest of factors in this area were not statistically significant by gender, STEM by gender and Non-STEM by gender:

- Is what's expected in order to earn tenure reasonable to faculty regarding their performance as? – a teacher; a colleague in your department; a campus citizen; and a member of the broader community (e.g. outreach).
- Is what's expected in order to earn tenure clear to faculty regarding their performance as a campus citizen; and a member of the broader community (e.g. outreach).
- The clarity of the following aspects of earning tenure in their department – the tenure process in their department.

- The clarity of the following aspects of earning tenure in your department – the tenure criteria (what things are evaluated) in their department.
- Received formal feedback on their progress toward tenure.
- Timeframe for submitting their dossier for promotion to full professor?

Mentoring Variables – Findings

This section had a total of 16 variables/factors in reference with mentoring. The findings for mentoring factors show if there were significant difference by gender and within discipline (STEM vs. Non-STEM) if there were significant differences by gender. The table below summarized the number of factors that differ by gender, STEM by gender, and Non-STEM by gender.

Table 39

Mentoring variables similar and different by gender and within discipline by gender.

Mentoring	Gender			STEM by Gender			Non-STEM by Gender		
Area	Sign.	Not Sign.	Total	Sign.	Not Sign	Total	Sign.	Not Sign.	Total
Mentoring	14	2	16	13	3	16	12	4	16

Twelve out of the 16 factors were statistically significantly different by gender, STEM by gender, and Non-STEM by gender:

- Please indicate how important or unimportant each of the following is to your success as a faculty member – Having a mentor or mentors in your department; having a mentor or mentors outside your department at your institution; and having a mentor or mentors outside your institution.

- Please rate the effectiveness or ineffectiveness of the following for you – mentoring from someone outside your department at your institution; and mentoring from someone outside your institution.
- Level of agreement or disagreement with – there is effective mentoring of tenured associate professors in my department; my institution provides adequate support for faculty to be good mentors; and there is effective mentoring of pre-tenure faculty in my department.
- At this institution and in the past five years, I have served as either a formal or informal mentor to - Non-tenure track faculty in my department; pre-tenured faculty outside my department; and non-tenure-track faculty outside my department.
- Would you agree or disagree that being a mentor is/has been fulfilling to you in your role as a faculty member?

The last 4 factors varied. At their institution faculty was asked if they have served as either a formal or informal mentor to tenured faculty in their department. This factor is statistically significantly different only by gender and for female and male faculty in STEM. Similarly, mentoring tenured faculty outside their department only differed by gender. Finally, the last two factors – having served as a formal or informal mentor to pre-tenured faculty in their department; and the effectiveness or ineffectiveness of mentoring from someone in their department was not statistically significant by gender, STEM by gender, and Non-STEM by gender.

Research Question 3

3. What job satisfaction/fulfillment factors relate to the importance of a pre-tenured faculty succeeding as a faculty member (STEM vs. Non-STEM)?

Findings

The question is how important or unimportant is having a mentor or mentors in their department is/are to their success as a faculty member? And, given their response, what job satisfaction/fulfillment factors influence this decision? To answer this question, only on tenure track faculty were selected and separated by type of discipline (STEM vs. Non-STEM). Job satisfaction/fulfillment factors were selected from their Nature of Work, Nature of Service, Nature of Teaching, and Nature of Research. These four areas were selected based on the strong influence these areas have on faculty's road to tenure.

In Chapter IV, the findings were listed as model 3 and 6. Although both models are not a good fit based on Pearson's Goodness of fit test, they show a stark similarity and differences on job satisfaction/fulfillment factors. Model 3 shows the factors highly associated with STEM faculty, and Model 6 with Non-STEM faculty for this research question. There was one common factor appearing in both models. Both STEM and Non-STEM faculty determined that the support their institution has offered them for improving their teaching [Q70F] is an influential factor for how important or unimportant it is to have a mentor or mentors in their department; and to their success as a faculty member. Since the development of postsecondary education, teaching has been a critical and a focal point for faculty's success in academia.

Both models showed that there were job satisfaction/fulfillment differences between both groups. Non-STEM faculty had job satisfaction/fulfillment factors: portion

of time spent on teaching; quality of students they teach, on average; support the institution has for obtaining externally funded grants (pre-award); and support the institution has offered for securing graduate student assistance. STEM faculty on-the-other-hand had factors such as managing externally funded grants (post-award); and the support your institution has offered for travelling to present papers or conduct research/ creative work.

STEM faculty satisfaction level with managing externally funded grants (post-award) varies from Non-STEM faculty with support for obtaining externally funded grants (pre-award). One group sees the need for support to manage externally funded grants and the other with obtaining externally funded grants. This variation shows that the type of support on grants at different times are crucial for pre-tenured faculty by discipline to view mentoring as a positive direction towards their success in academia. Another difference is seen with the support the institution has offered for STEM faculty to travel to present papers or conduct research/creative work; on-the-other-hand non-STEM faculty model shows the need for the support the institution has offered for securing graduate student assistance.

Non-STEM faculty model expresses two additional factors compared to Non-STEM faculty: portion of their time spent on teaching; and the quality of student they teach, on average. Factors that contributed to the Non-STEM faculty model showed 4 factors related directly to teaching and 1 to the support for obtaining externally funded grants (pre-award). STEM faculty model had 1 factor related to managing externally funded grants (post-award), 1 factor to teaching, and 1 factor support for travelling to present papers or conduct research/creative work.

Table 40

Findings for Model 3 (STEM Faculty) and Model 6 (Non-STEM Faculty)

Model 3 (STEM Faculty)	Model 6 (Non-STEM Faculty)
Q85B – Please rate the level of satisfaction or dissatisfaction with managing externally funded grants (post-award).	Q45A – Please rate the level of satisfaction or dissatisfaction with the portion of your time spent on teaching.
Q85D – Please rate the level of satisfaction or dissatisfaction with the support your institution has offered you for travelling to present papers or conduct research/creative work.	Q70E – Please rate your level of satisfaction or dissatisfaction with the quality of student you teach, on average.
Q70F – Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for improving your teaching.	Q70F – Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for improving your teaching.
	Q85A – Please rate your level of satisfaction or dissatisfaction with the support your institution has for obtaining externally funded grants (pre-award).
	Q85C – Please rate your level of satisfaction or dissatisfaction with the support your institution has offered you for securing graduate student assistance.

Research Question 4

4. What job satisfaction/fulfillment factors relate to the likelihood that tenured faculty mentor in their department?

Findings 1

This research question asks what job satisfaction/fulfillment factors relate to the likelihood that tenured faculty mentor in their department? Only tenured faculty in STEM and in Non-STEM disciplines were selected for this part of the research question.

Job satisfaction/fulfillment factors were selected from their Nature of Work, Nature of Service, Nature of Teaching, and Nature of Research. These four areas were selected based on the strong influence they have on faculty's road to tenure.

In Chapter IV, the findings were listed as model 1 and model 4. Both models are good fit models based on the Hosmer & Lemeshow Goodness of Fit Test. Model 1 shows the factors highly associated with STEM faculty, and Model 4 with Non-STEM faculty. Both models did not express a common factor. Model 1 (STEM faculty) has three main factors added to the logistic regression model – The satisfaction level associated with the quality of student they teach (on average), the influence they have over the focus of their research/scholarly/creative work, and the quality of graduate students to support their research/scholarly/creative work. For faculty in Non-STEM (Model 4), the logistic regression model tailored three main factors – portion of time spent on administrative tasks (e.g. creating and submitting reports, routine paperwork), the number of courses they teach, and the discretion they have over the content of the courses they teach.

In the STEM faculty model, one factor was associated with the quality of students they teach, and two factors associated with their research/scholarly/creative work. In order to view whether STEM faculty have mentored in the past 5 years, they look at the influence they have over the focus of their research/scholarly/creative work. More interesting is the fact that one of the factors looks at the quality of students they teach, but also the quality of graduate students to support their research/scholarly/creative work.

On-the-other hand Non-STEM faculty has three factors – one linked to the time they spend on administrative tasks and two on courses (i.e. content and the number of

courses they teach). To contrast, STEM faculty model emphasizes on the influence they have over the focus of their research/scholarly/creative work, whereas the non-STEM model focuses on the content of the courses they teach.

Table 41

Findings for Model 1 (STEM Faculty) and Model 4 (Non-STEM Faculty)

Model 1 (STEM Faculty)	**Model 4 (Non-STEM Faculty)**
Q70E – Please rate your level of satisfaction or dissatisfaction with the quality of student you teach, on average.	Q45E – Please rate your level of satisfaction or dissatisfaction with the portion of your time spent on administrative tasks (e.g. creating and submitting reports, routine paperwork).
Q80B – Please rate your level of satisfaction or dissatisfaction with the influence you have over the focus of your research/scholarly/creative work.	Q70A – Please rate your level of satisfaction or dissatisfaction with the number of courses you teach.
Q80C – Please rate you're your level of satisfaction or dissatisfaction with the quality of graduate students to support your research/scholarly/creative work.	Q70C – Please rate your level of satisfaction or dissatisfaction you have over the content of the courses you teach.

Findings 2

This research question asks what job satisfaction/fulfillment factors relate to the likelihood that tenured faculty mentor in their department? Only tenured faculty in STEM and in Non-STEM disciplines were selected for this part of this research question. Job satisfaction/fulfillment factors were selected from Collaboration, Resources and Support, Institutional Governance & Leadership, Climate, Appreciation & Recognition, Engagement, and Global.

In Chapter IV, the findings were listed as model 2 and model 5. Only model 5 is a good fit model based on the Hosmer & Lemeshow Goodness of Fit Test. Model 2 shows the factors highly associated with STEM faculty, and Model 5 with Non-STEM faculty. Model 5 (Non-STEM faculty) had zero factors associated to the dependent variable (Whether faculty have mentored on-tenure track and/or tenured faculty in their department). Model 2 (STEM faculty) has 4 variables associated with dependent variable – Lab, research, studio space; eldercare, flexible workload/modified duties for parental or other family reasons; and collaboration within the institution, faculty outside your department.

Table 42

Findings for Model 2 (STEM Faculty) and Model 5 (Non-STEM Faculty)

Model 2 (STEM Faculty)	**Model 5 (Non-STEM Faculty)**
Q90B – Please rate the level of satisfaction or dissatisfaction with the following aspects of your employment – Laboratory, research, or studio space.	
Q95H – Please rate the level of satisfaction or dissatisfaction with the following aspects of your employment – Eldercare.	
Q95K – Please rate the level of satisfaction or dissatisfaction with the following aspects of your employment – Flexible workload/modified duties for parental or other family reasons.	
Q105E – Please rate the level of satisfaction or dissatisfaction with your opportunities for collaboration with – within your institution, faculty outside your department.	

Summary of Entire Study

The changes, challenges and the shaping of the present faculty gives rise to a new era of academics in higher education. Teaching, research, service, or administrative tasks share an intricate web of endless possibilities for faculty in higher education. Thus, no two-faculty members in this country, state, institution, department or let alone area of discipline are the same. And, their needs vary at different stages of their academic career. This study provides a window to faculty's job satisfaction/fulfillment and importance of these factors upon their work with younger faculty, as it is distributed by gender and discipline (STEM vs. Non-STEM). The study also focuses on the act of mentoring and provides data on factors influencing the mentoring activity by type of discipline (STEM vs. Non-STEM).

To answer the research questions, this study is composed of five chapters – Introduction, Literature Review, Methods, Results, and the Conclusion. The introduction entails the background of the study, statement of problem, purpose of the study, research question, signification/delimitations of the study, definition of terms, and organization of the study. The second chapter provides the literature review with degrees awarded, faculty in higher education, mentoring, and job satisfaction. Following, the methods chapter provides the design of the study, instrumentation, data population, data collection, and data analysis.

Chapter IV presents the findings of the study by presenting an analysis of the 2011 COACHE data to address each of the research questions. It highlights the demographics based on type of discipline, gender and tenure status. This study focuses primarily on job satisfaction/fulfillment, job importance, and mentoring of faculty in

higher education. It further shows which factors are significantly different by gender, discipline (STEM vs. Non-STEM), and within discipline by gender by using ANOVA. It also tests what job satisfaction factors influence mentoring in tenure and on-tenure-track faculty using logistic and categorical regression.

How satisfied faculty are depends on many aspects of their job. This research study focuses on 11 areas of faculty life – nature of work, nature of service, nature of teaching, nature of research, resources & support, collaboration, institutional governance & leadership, climate, appreciation & recognition, global, and engagement. Within each of these areas there are various factors/variables that were tested differences by discipline (STEM vs. Non-STEM), gender, and within discipline by gender. Chapter IV showed the results for each of the factors. Previously, all the factors were grouped in the 11 areas for this study.

Job Satisfaction, Job Importance, and Mentoring by Discipline

Job satisfaction/fulfillment had 68 out of the 84 factors statistically significant by discipline. That is about 80% of the factors were different by STEM and Non-STEM fields. This study shows which factors differ and at the same time shows how different these fields are. Just as the factors that are different by discipline are critical, so are the ones that not statistically significant. These factors show that both STEM and Non-STEM faculty agree with their level of satisfaction with these 16 factors.

In terms of job importance, 23 out of the 35 factors differ by discipline. Almost two-thirds of factors were statistically significant by discipline. Eighteen out of the 29 factors differ by discipline were from tenure & promotion. Also, most of the factors that were

not statistically significant came from tenure & promotion (11). Following, mentoring had 16 factors, of which 10 were statistically significant by discipline.

Job Satisfaction, Job Importance, and Mentoring by Gender

Over the past two decades, women faculty have higher representation in academia. Generally, higher representation of women is seen in the lower ranks in academia. Lower representation, on-the-other-hand, is seen in the upper ranks of the professorship and in STEM disciplines. This study shows factors in job satisfaction/fulfillment, job importance, and mentoring that vary by gender and within discipline by gender.

Satisfaction level for faculty differs by gender for 59 out of the 84 factors. Most of the areas within job satisfaction/fulfillment showed significant differences by gender with the exception of institutional governance & leadership (i.e. 10 out of 15), and engagement (i.e. 4 out of 4). Non-STEM female and male faculty differ with 57 out of the 84 factors. They had similar results when compared to differences by gender, in general. More surprising were the results from STEM female and male faculty. Forty-three factors out of the 84 were statistically significant by gender. There are more factors in which STEM female and male faculty agree with their level of job satisfaction. This is surprising due to STEM faculty having a lower female representation.

Job importance (i.e. resources & support, and tenure & promotion) for female and male faculty differs with 21 out of the 35 factors. STEM female and male faculty had similar results (i.e. 20 out of 35). Non-STEM faculty had 15 factors that differ by gender. Non-STEM faculty had 6 less factors that were different by gender in tenure & promotion than STEM female and male faculty. For mentoring, were 14 (gender), 13 (STEM by

gender) and 12 (non-STEM by gender) factors that were statistically significantly different out of 16 factors in each group.

Job Satisfaction/Fulfillment & Mentoring Models

On-tenure-track faculty start academia with various backgrounds and on many occasions set towards a path of uneasiness and overwhelming complexities. Balancing academia with aspects such as teaching, research, service, administration can be a daunting task. Mentoring of faculty in higher education is critical especially for on-tenure-track faculty. And, even those who have gained tenure status seek guidance, support and mentoring throughout their academic career. This study proposes several models that show job satisfaction/fulfillment factors influencing mentoring in tenure and on-tenure-track faculty.

Model 3 (STEM faculty) and Model 6 (Non-STEM faculty) are categorical regression models showing job satisfaction/fulfillment factors influencing the importance of on-tenure-track faculty to determine whether having a mentor or mentor is important to their success as faculty. Although these models were not a good fit models, they show several job satisfaction factors that are critical to both STEM and non-STEM faculty. The STEM faculty model has institutional support for managing externally funded grants (post-award); support for travelling to present papers or conduct research/creative work; and support the institution has offered for improving teaching. On-the-other-hand, Non-STEM faculty had job satisfaction/fulfillment factors pertaining to the portion of time spent in teaching; quality of students they teach (on average); support the institution has offered for improving teaching; institutional support for obtaining externally funded grants (pre-award); and institutional support for securing graduate student assistance.

The last models were geared towards whether tenure faculty mentored on-tenure-track and/or tenured faculty. The models determined what job satisfaction/fulfillment factors (i.e. nature of work, nature of teaching, nature of research, and nature of service) influence mentoring. The STEM faculty logistic (Model 2) regression model had 3 factors – quality of students they teach (on average); influence faculty have over the focus of their research/scholarly/creative work; and the quality of graduate students they have to support their research/scholarly/creative work. Non-STEM faculty (Model 5) had three factors – portion of time spent on administrative task; the number of courses they teach; and the content of the courses they teach.

The last two models selected factors from the areas of collaboration, resources and support, institutional governance and leadership, climate, appreciation and recognition, engagement, and global. Only the STEM faculty model was possible. The Non-STEM faculty model had zero job satisfaction/fulfillment factors associated to mentoring. STEM faculty model had 4 job satisfaction/fulfillment factors – laboratory, research, or studio space; eldercare; flexible workload/modified duties for parental or other family reasons; and the opportunities for collaboration within their institution, faculty outside their department.

These models propose job satisfaction/fulfillment factors that influence mentoring of STEM and Non-STEM faculty in academia. In almost all of these models, faculty by discipline vary with the factors that affect their decision to mentor or be mentored. These factors could be useful for building or to improving a mentoring faculty program at an institution. Either by improving the satisfaction level or recognizing the importance of

the job satisfaction/fulfillment factors associated with mentoring can build stronger mentoring relationships among faculty by discipline.

Recommendations and Future Research

Providing faculty with the same shoe fits all is highly unlikely to have the same rippling effect across academia. Pinpointing, addressing what causes these differences, and orchestrating recommendations towards the differences can add to a healthier institution. STEM and Non-STEM faculty vary in many aspects of their job satisfaction/fulfillment, job importance and mentoring. Several of these factors are also statistically significantly different by gender. These findings suggest that in several aspects of faculty's life, their needs can vary by gender and discipline. This implies that their needs would require the implementation and strengthening of new and existing faculty programs at institutions in higher education. For administrators, these findings can help them with recognizing these differences and assist them to make and amend policies that can positively impact faculty because of gender or discipline. Future research can explore why some of these factors vary and others are similar by discipline and gender.

As for the regression models in this study, they provide insight into which job satisfaction/fulfillment factors influence mentoring of STEM and Non-STEM faculty in higher education. In most of the models, they varied across discipline. This shows that faculty in these two different disciplines emphasize on different aspects of their job satisfaction to mentor and/or see mentoring as an important component for their success as an academic. These factors can support and encourage mentoring to become a fundamental part of an academic's culture. Time is very critical to an academic. The

more satisfied faculty are to these job satisfaction factors, the more time they can allot to mentoring.

Future research can explore on why some job satisfaction/fulfillment, job importance and mentoring factors vary and others are similar by discipline and gender. Why are faculty equally satisfied or not with these different aspects of their job? Farther research can explore if there are job satisfaction/fulfillment factors that influence mentoring by gender and discipline (by gender). What causes men and women to have similar or different job satisfaction/fulfillment factors influence their decision to mentor or be mentored?

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Appendix 1

Table 2.2—Number and percentage of higher education instructional faculty and staff in 4-year institutions, by employment status and program area: Fall 1987 and Fall 1992

Program area and year	Instructional faculty and staff	Employment status	
		Full-time	Part-time
1992			
All program areas in 4-year institutions*	604,828	67.1	32.9
Agriculture/home economics	11,016	88.0	12.0
Business	45,865	63.0	37.0
Education	50,860	59.2	40.8
Engineering	26,775	76.1	23.9
Fine arts	47,581	56.5	43.5
Humanities	83,299	64.9	35.1
Natural sciences	101,995	78.1	21.9
Social sciences	68,534	70.1	29.9
All other fields	75,241	58.9	41.1
1987			
All program areas in 4-year institutions*	562,843	73.7	26.3
Agriculture/home economics	12,022	84.0	16.0
Business	42,304	67.7	32.3
Education	40,765	78.0	22.0
Engineering	26,189	79.9	20.1
Fine arts	48,516	56.9	43.1
Humanities	81,872	74.2	25.8
Natural sciences	95,911	78.0	22.0
Social sciences	57,925	81.7	18.3
All other fields	46,041	63.1	36.9

* Health sciences faculty are included in the program area total but are not shown separately. See Technical Notes for details.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993 National Study of Postsecondary Faculty, "Faculty Survey" and 1988 National Survey of Postsecondary Faculty, "Faculty Survey."

Appendix 2

Table 2.6—Number and percentage of full-time higher education instructional faculty and staff in 4-year institutions, by tenure status and program area: Fall 1987 and Fall 1992

Program area and year	Full-time instructional faculty and staff	Tenure status				
		Tenured	On tenure track	Not on tenure track	No tenure system for faculty status	No tenure system at institution
1992						
All program areas in 4-year institutions*	405,783	55.5	23.5	12.4	4.5	4.1
Agriculture/home economics	9,698	72.4	19.3	4.1	3.5	0.7
Business	28,895	51.5	29.9	10.4	3.6	4.5
Education	30,127	54.9	23.6	14.1	4.7	2.7
Engineering	20,381	61.8	27.5	6.0	1.4	3.3
Fine arts	26,874	52.9	22.1	9.7	3.4	11.9
Humanities	54,093	59.9	18.7	11.6	5.5	4.3
Natural sciences	79,663	63.7	21.4	9.0	3.1	2.8
Social sciences	48,030	63.4	23.0	8.5	2.5	2.7
All other fields	44,346	49.1	25.7	13.6	6.8	4.8
1987						
All program areas in 4-year institutions*	414,832	58.5	23.9	8.9	3.9	4.7
Agriculture/home economics	10,104	75.3	16.8	4.9	2.6	0.4
Business	28,630	42.9	36.7	11.5	3.6	5.3
Education	31,812	60.5	18.9	12.5	3.6	4.5
Engineering	20,915	61.8	29.9	4.5	2.4	1.2
Fine arts	27,628	56.5	23.0	8.1	4.7	7.7
Humanities	60,781	68.7	15.8	6.7	4.7	4.1
Natural sciences	74,852	63.3	23.2	7.2	3.2	3.2
Social sciences	47,324	67.9	21.9	5.2	1.9	3.1
All other fields	29,042	53.5	31.2	9.0	3.4	3.0

* Health sciences faculty are included in the program area but are not shown separately. See Technical Notes for details.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993 National Study of Postsecondary Faculty, "Faculty Survey" and 1988 National Survey of Postsecondary Faculty, "Faculty Survey."

Appendix 3

Table 2.4—Number and percentage of full-time higher education instructional faculty and staff in 4-year institutions, by academic rank and program area: Fall 1987 and Fall 1992

Program area and year	Full-time instructional faculty and staff	Academic rank				
		Full professor	Associate professor	Assistant professor	Instructor or lecturer	Other ranks/ not applicable
1992						
All program areas in 4-year institutions*	405,783	33.9	26.5	27.0	9.8	2.8
Agriculture/home economics	9,698	44.6	24.6	21.9	6.6	2.3
Business	28,895	26.5	30.2	31.2	10.0	2.1
Education	30,127	26.3	32.5	26.2	11.3	3.7
Engineering	20,381	39.5	30.4	25.2	4.4	0.6
Fine arts	26,874	33.3	27.7	23.6	9.9	5.6
Humanities	54,093	36.1	25.8	21.7	13.4	2.9
Natural sciences	79,663	41.6	25.0	23.2	7.1	3.1
Social sciences	48,030	40.2	26.0	26.3	6.1	1.3
All other fields	44,346	32.1	24.0	28.3	12.1	3.5
1987						
All program areas in 4-year institutions*	414,832	36.8	26.9	25.7	8.6	2.0
Agriculture/home economics	10,104	45.9	26.6	19.4	7.8	0.2
Business	28,630	24.9	24.9	33.0	14.1	3.2
Education	31,812	32.3	25.5	26.8	12.5	3.0
Engineering	20,915	45.0	28.2	23.0	3.8	0.0
Fine arts	27,628	28.6	29.0	28.7	7.7	6.1
Humanities	60,781	42.5	26.7	20.6	8.5	1.8
Natural sciences	74,852	43.2	27.6	21.2	6.9	1.1
Social sciences	47,324	41.7	28.6	25.0	2.9	1.9
All other fields	29,042	32.0	25.2	29.2	12.5	1.2

* Health sciences faculty are included in the program area total but are not shown separately. See Technical Notes for details.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993 National Study of Postsecondary Faculty, "Faculty Survey" and 1988 National Survey of Postsecondary Faculty, "Faculty Survey."

Appendix 4

Table 2.12—Number and percentage of full-time higher education instructional faculty and staff in 4-year institutions, by sex and program area: Fall 1987 and Fall 1992

Program area and year	Full-time instructional faculty and staff	Sex	
		Male	Female
1992			
All program areas in 4-year institutions*	405,783	70.4	29.6
Agriculture/home economics	9,698	77.3	22.7
Business	28,895	76.4	23.6
Education	30,127	52.7	47.3
Engineering	20,381	94.2	5.8
Fine arts	26,874	67.3	32.7
Humanities	54,093	62.2	37.8
Natural sciences	79,663	83.3	16.7
Social sciences	48,030	73.9	26.1
All other fields	44,346	68.4	31.7
1987			
All program areas in 4-year institutions*	414,832	75.3	24.7
Agriculture/home economics	10,104	68.6	31.5
Business	28,630	77.3	22.7
Education	31,812	59.0	41.0
Engineering	20,915	96.9	3.1
Fine arts	27,628	70.9	29.2
Humanities	60,781	74.1	25.9
Natural sciences	74,852	84.0	16.0
Social sciences	47,324	80.2	19.8
All other fields	29,042	77.0	23.1

* Health sciences faculty are included in the program area total but are not shown separately. See Technical Notes for details.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1993 National Study of Postsecondary Faculty, "Faculty Survey" and 1988 National Survey of Postsecondary Faculty, "Faculty Survey."