POST-DVM EDUCATIONAL INTENTIONS AMONG THIRD-YEAR VETERINARY MEDICAL STUDENTS: A HIERARCHICAL ANALYSIS OF MENTORING, GENDER, AND ORGANIZATIONAL CONTEXT

By

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the dissertation of TORI C. BYINGTON find it satisfactory and recommend that it be accepted.

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All life represents a risk. And the more lovingly we live our lives, the more risks we take.—M. Scott Peck

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POST-DVM EDUCATIONAL INTENTIONS AMONG THIRD-YEAR VETERINARY MEDICAL STUDENTS: A HIERARCHICAL ANALYSIS OF MENTORING, GENDER, AND ORGANIZATIONAL CONTEXT

Abstract

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Chair: Amy S. Wharton

Despite progressive movement towards gender equality in other high status professions the pervasive under representation of women and minorities in science, technology, engineering, and math (STEM) persists. Scholars from numerous disciplines have examined the issue of women and science since the 1960s. However, much of this research has ignored the effects of social resources on individuals' life chances. While there are many different kinds of social resources, research conducted in educational and occupational settings suggests that social ties with mentors may be especially influential. Of equal importance is the organizational context which structures people's opportunities for social relationships and, as a result, plays an important role in the availability, quality, and impact of mentoring.

This study utilized a multilevel design, with data collected from 644 third-year veterinary students at 23 of the 27 US colleges of veterinary medicine The individual-level data was derived from an 82-item questionnaire that included

measures of mentoring functions and satisfaction, past and present experiences with mentoring, individual-level characteristics, and career plans and goals. Organizational level data was collected from various archival sources including college publications, web pages, professional journals, and professional organizations. In addition, the Dean of Students at the participating colleges responded to a short, 16-item organizational questionnaire about theoretically important questions not available through archival research.

The results show that sex differences in mentoring do occur. Female students are less likely than male students to have a mentor and to have a mentor their sex. In addition, the sex composition of the relationship affected mentoring functions and outcomes. Furthermore, female students with faculty mentors who were primarily researchers were more likely to have plans to seek graduate training than were male students or female students with other mentor types. The percent of female students and percent of tenured female faculty at a college was also shown to significantly influence female students' educational and career decisions.

The findings have implications for understanding the complexity underlying women's participation in STEM and for policies and practices that support mentoring in STEM disciplines.

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Chapter One

INTRODUCTION

Women in science, technology, engineering and math (STEM) are a select group whose educational background and ability are as strong, or stronger, than that of their male colleagues (Fox & Colatrella, 2006). Yet, although there has been movement towards gender equality in other high status professions (Reskin & Roos, 1990), the under-representation of women at the upper ranks of STEM continues in most industrialized countries, including the United States (National Science Foundation, 2003; National Science Foundation, 2004; Goodman Research Group, 2002; Lee, 2002; National Research Council, 2001; National Research Council, 1991).

In 2001 women earned slightly more than half of the bachelor's degrees in the combined STEM disciplines: 49% in agricultural sciences; 59% in biology; 27% in computer science; 40% in earth, atmospheric, and ocean sciences; 48% in mathematics; 42% in the physicals sciences; 77% in psychology; 55% in social sciences; and 20% in engineering (National Science Foundation, 2004).[1] This increase in the number of women earning baccalaureate degrees in science and engineering does not, however, translate into a comparable increase in the number of women seeking advanced training in STEM. More women than men end their educations at the baccalaureate level and the difference is especially pronounced in science and engineering.

[1] The number of STEM bachelor degrees awarded to females has increased every year since 1966, reaching 202,583 in 2002 while the number of bachelor degrees in STEM earned by males has fluctuated around 200,000 since 1976 (National Science Foundation, 2004)

As more women than men seek baccalaureate degrees this pattern of educational segregation will negatively influence our nation's ability to meet the growing human resource needs of research and development, academic science, and professional leadership in STEM disciplines (Land of Plenty, 2000). The National Academy of Sciences (2006) state that the number of people with doctorates in the sciences, mathematics, and engineering awarded by US institutions each year has not kept pace with the increasing importance of science and technology to the nation's prosperity. This reality coupled with the fact that a quarter of the current science and engineering workforce is more than 50 years old and will retire by the end of this decade (National Science Board, 2000), makes the retention of women and minorities in the STEM "pipelines" a national imperative.

Researchers from numerous disciplines have examined the under representation of women in STEM since the 1960s. Their research tends to fall into one of two areas: individual-level studies of factors contributing to gender differences in STEM educational or career attainment; or cultural and structural factors, such as the educational climate of STEM (Seymour & Hewitt, 1997; Rosser, 1993).

There are significant gaps in both research streams. For example, research on individual-level factors has examined the experiences of women and men in science during their high school and college years (Seymour & Hewitt, 1997; Eisenhart & Finkel, 1998; Correll, 2001) and the experiences of women and men who are currently employed as scientists (e.g., Valian, 1998; Long, 1990;

Zuckerman, 2001; Reskin, 1978), but significantly less is known about the intervening period. Hence, we know relatively little about the factors that influence women's or men's decisions to pursue graduate education in the sciences and engineering (Sax, 1996; Lovitts, 2001).

Of the few studies that do examine graduate and professional training, the majority combine students in multiple STEM disciplines with the assumption that, regardless of the discipline or the organizational context, women face identical challenges (Goodman Research Group, 2002). Studies of the educational climate are also somewhat limited, as they often focused on single case studies rather than more systematic analyses of contextual-level factors. In addition, much of the research on gender inequality in STEM has ignored the effects of social resources on individuals' life chances. While there are many kinds of social resources, research conducted in educational and occupational settings suggests that social ties with mentors may be especially influential.[2] Gender differences in social resources and in mentoring relationships in particular, may play a role in explaining women's persistent educational and career disadvantages relative to men (Raider & Burt, 1996).

[2] A mentor is generally defined as a experienced person to whom one turns for advice or support about educational or professional matters (Gaskill, 1991; Atkinson, Casas, & Neville, 1994; Ragins, Cotton & Miller, 2000). Although the terms mentor and role model are often used interchangeably mentoring is typically understood to involve interaction and active intervention by the mentor on behalf of the protégé, whereas the term a role model implies only identification on the part of the observer with a passive or uninvolved model (Gibson & Cordova, 1999).

Overview of Mentoring

Greek Mythology is credited with the origins of the concept of mentoring. In Homer's tale of *The Odyssey*, Mentor, son of Alcinous, accepted the charge of educating Odysseus' son Telemachus, while Odysseus fought the Trojan War. Unfortunately, while Mentor's intentions were good, he proved to be a failure at his appointed task. A careful reading of *The Odyssey* reveals that the useful advice Telemachus did receive during this time came not from Mentor, but from Athena, the goddess of war and wisdom, who impersonated Mentor in order to provide guidance, support and wise and trusted counsel for Telemachus (Koocher, 2002).

Given this complicated narrative many people overlook the feminist roots of mentoring and assume that it is male in origin. Our current concept of mentoring evokes an image of a more powerful and knowledgeable individual, usually a man, taking an active interest in the development of a younger, less experienced person. Mentoring has been shown to enhance career development, competence and self esteem, and increase the protégé's professional resources and networks (Dipboye, 1987; Ragins & McFarlin, 1990; Ragins & Cotton, 1999). For example, Linda J. Sax (1996) found that women pursue STEM graduate degrees more often if they have a mother who is either a research scientist or a college teacher. Lovitts (2001) also identified a student's relationship with his or her mentor or advisor as key in the successful completion of an advanced degree. Additional research has shown that a lack of mentoring and guidance,

especially early in ones career, is a prominent factor behind women's exit from STEM occupations (Preston, 2004). While mentoring has been shown to impact career choices, educational persistence, and career outcomes (Valian, 1998; Seymour & Hewitt, 1997; Catron, 1997; Scandura & Ragins, 1993), little research has systematically examined the effects of mentoring on the educational persistence of women and men in science specifically.

Mentoring does not take place in isolation, however, organizational characteristics, such as size, resources, and demographics all influence students' access to mentors and the qualities of the mentoring relationship. For this study I examined sex differences in mentoring experiences of third year veterinary medical students at 23 of the 27 US colleges of veterinary medicine and how those differences influence students' educational and career decisions.

Research Context

There are two reasons I have chosen veterinary medicine for my research context. First, veterinary medicine is a historically male-dominated field that is feminizing rapidly. The number of women practicing veterinarian medicine grew from 1.8% in 1960 to 36% in 1999 and is expected to reach 67% by 2015. Thus it offers a unique opportunity to study not only individual characteristics, but also organizational characteristics that shape men's and women's career decisions. Second, a study of mentoring may offer insights into the mechanisms that make gender invisible in the STEM disciplines even while the mechanisms advantage

men. These insights may prove valuable in decreasing gender inequality in other historically male disciplines such as engineering and physics.

Veterinary Medicine has long been associated with male practitioners and male educators. Veterinary programs in the United States accepted female students only rarely in the first half of the twentieth century (Association for Women Veterinarians, 1997). It was not until the 1970's that the number of female veterinary medical students began to increase. Approximately 9700 students are currently enrolled at the 27 accredited colleges of veterinary medicine in the United States, 70% of which are female (Brown & Silverman, 1999). By 2015, the American Veterinary Medical Association predicts that women will make up 78% of the professional student population (Brown & Silverman, 1999).

This increase in female enrollment is due to a number of factors including the construction of several new colleges of veterinary medicine, increased class size at existing schools, and the passage of the Title IX Legislation in 1972. In addition, fewer men are applying for admission to veterinary colleges. The number of first year male students enrolled in North American colleges of veterinary medicine slumped from a high of 1483 in 1972 to a mere 932 in 2003. Yet, not unlike other prestigious professions, horizontal and vertical gender segregation persists (Curran, 1995; Daily, Certo, & Dalton 1999; Bickel, Wara, Atkinson, Cohen, Dunn, Hostler, Johnson, Morahan, Rubenstein, Sheldon, & Stokes, 2002). For example, until 2003 there were no female deans of a

veterinary college[3] and women comprised only 9% of the senior academic administrative positions; 14% of the full professor positions; 30% of associate professor positions; and 45%of the assistant professor positions (Association of American Veterinary Medical Colleges, 2003). Hence, while women constitute a majority of veterinary students, they remain significantly underrepresented among senior veterinary faculty and administrators.

Description and Justification of Studies

Previous research has identified factors leading to sex differences in the study of STEM at the high school and college levels. Less well understood are the factors that shape women's and men's decisions to pursue advanced graduate training in STEM fields. The literature suggests that mentorship is important for women in male-dominated educational disciplines but is less clear about how various aspects of mentoring interrelate to shape career choices and outcomes and how the effects of mentoring may depend upon features of the larger context within which they occur.

My research focuses on a single science discipline and examines variation across individuals and colleges. In addition to examining sex differences in mentoring experiences it also examines how those differences influence students' educational and career decisions. What follows are two manuscripts which make up two distinct chapters of this dissertation. In Chapter Two, I

[3] In 2003 Dr. Shirley Johnston became the first female Dean of an American Veterinary College when Western University of Health Sciences received a provisional accreditation status and accepted their first cohort of students.

examine how individual and contextual factors interact to shape access to mentors and the quality of the mentoring relationship. In particular, I explore gender differences in students' access to mentors, differences in the quality of the mentoring relationship based on dyad sex-composition, and how features of the larger organizational context shape and condition the effects of mentoring.

In Chapter Three, I explore how women and men with a history of success in STEM disciplines differ in their pursuit of graduate training–in particular I examine: (1) how individual characteristics influence women and men's career intentions; (2) sex differences in the influence of external forces, such as parents and mentors; and (3) the effect of the educational institution's organizational context on individual career choices.

It is my hope that my research will lead to a better understanding of how mentoring can be used effectively to bring more women into the STEM disciplines and professions.

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Chapter Two

First Manuscript

AN ANALYSIS OF GENDER DIFFERENCES IN MENTORING ACCESS AND QUALITIES AMONG THIRD-YEAR VETERINARY STUDENTS

Introduction

Despite progress toward gender equality in other high status professions (Reskin & Roos, 1990) the pervasive under-representation of women and minorities in science, technology, engineering, and math (STEM) persists (National Science Foundation, 2004; National Science Foundation, 2003; Goodman Research Group, 2002; Lee, 2002; National Research Council, 2001; National Research Council, 1991). While in all disciplines, more women than men end their educations at the baccalaureate level, this difference is especially pronounced in sciences and engineering. Women are only 45% as likely as men to enroll in graduate programs in science and engineering (Xie & Shauman, 2003). In 2001 women were 41% of graduate students in STEM disciplines, earned 44% of STEM master degrees, and 37% of doctoral degrees (National Science Foundation, 2004). Although this achievement may seem remarkable given that before the 1970s few women entered college at all let alone in the STEM disciplines, it is tempered by evidence that women's gains are partly the result of men's declining interest in STEM programs (National Science Foundation, 2004; National Science Foundation, 2000; Luckenbill-Edds, 2002).

Researchers from numerous disciplines have examined women's under-representation in STEM since the 1960's. Despite the breadth and depth of the research, we still have limited knowledge of the processes that produce gender differences in science and engineering education and career outcomes. Scholars agree that women's under-representation in STEM can most likely be attributed to social structural and social psychological barriers rather than innate differences in scientific ability (American Sociological Association, 2005; Maccoby & Jacklin, 1974; Valian 1998).

Recent research on gender inequality in science suggests the importance of examining how individual choices are constrained by social and cultural norms. These norms are reflected in social structures and are reinforced by the significant actors in one's life (Xie & Shauman, 2003). In education, mentors are perhaps the most significant actors influencing achievement (Seymour & Hewitt 1997; Ibarra & Smith-Lovin 1997; Portes, 1998; Podolny & Baron, 1997; Ibarra, 1993).[1] Mentoring can be viewed as a social resource where faculty and professionals in the chosen discipline with whom a student may associate can provide career guidance, academic advice and information, psychosocial support, and act as role models (Ragins & Cotton, 1999; Queralt, 1982). In fact, many studies report that, for students who persevere in STEM education,

[1] A mentor is generally defined as a experienced person to whom one turns for advice or support about educational or professional matters (Gaskill, 1991; Atkinson, Casas, & Neville, 1994; Ragins, Cotton & Miller, 2000). Although the terms mentor and role model are often used interchangeably mentoring is typically understood to involve interaction and active intervention by the mentor on behalf of the protégé, whereas the term a role model implies only identification on the part of the observer with a passive or uninvolved model (Gibson & Cordova, 1999).

mentoring relationships consistently appear to play a critical role (Baker & Leary, 1995; Hill, Pettus, & Hedin, 1990). Mentors also play an important role in helping people anticipate and accomplish career transitions, defined as movement from one role to another (Ibarra, 1993; Ibarra & Smith-Lovin, 1997). Mentors are also particularly important for women's success in male-dominated professions (Dipboye, 1987; Ragins & McFarlin, 1990; Ragins & Cotton, 1999; Blake-Beard, 1999; Bizzari, 1995).

Mentoring does not take place in isolation, however. Organizational context structures the opportunities people have to form social relationships, including mentoring (Ibarra & Smith-Lovin, 1997; McPherson & Smith-Lovin, 1987). Organizational characteristics, such as size, resources, and demographics, such as the sex composition of the organization, influence access to mentors and the qualities of the mentoring relationship. In addition, research has shown that organizational context influences how women in non-traditional roles are perceived by others in the organization, especially other women (Ely, 1994, 1995). Organizational context also affects the formation of non-conscious beliefs, such as stereotypes (Dasgupta & Asgari, 2004).

In this study, I examine how individual and contextual factors interact to shape access to mentors and the quality of the mentoring relationship. In particular, I explore gender differences in students' access to mentors, differences in the quality of the mentoring relationship based on the sex composition of the dyad, and how features of the larger organizational context shape and condition the

effects of mentoring. My analyses draws on individual-level data collected from male and female third-year veterinary students at 17 colleges of veterinary medicine, as well as organizational-level data collected through surveys and archives.

This research is important for both methodological and substantive reasons. First, unlike previous research, which has combined students in multiple science and engineering disciplines, on the assumption that women face identical challenges regardless of setting (Goodman Research Group, 2002), I focus on a single discipline and examine variation across individuals and colleges. This enables me to assess systematically both individual and organizational-level influences on mentoring and the interactions between them as well.

This research is also important for substantive reasons. Because veterinary medicine is a rapidly feminizing field it may offer us a preview of the processes of feminization that may occur in other traditionally masculine disciplines such as physics and engineering.

Literature Review and Hypotheses

Sociologists have paid increasing attention to the effects of social resources on individuals' life chances (Lin, 1999; Portes, 1998; Campbell, Marsden, & Hulbert, 1986). Much of this research focuses specifically on educational and occupational attainment. Here, studies suggest that people's social ties exert a strong influence on their educational and career decisions and their

achievements (Seymour & Hewitt, 1997; Ibarra & Smith-Lovin, 1997; Portes, 1998; Podolny & Baron, 1997; Ibarra, 1993).

Gender differences in social resources and mentoring relationships in particular may play a role in explaining women's educational and career disadvantages relative to men (Raider & Burt, 1996). In their study of why students leave the STEM disciplines, Seymour and Hewitt (1997) note that the most marked difference between the sexes lies in the reason for their choice of majors: women were approximately twice as likely as men to have chosen a STEM major through the active influence of someone significant to them. In addition to the Seymour and Hewitt study, Sax (1996) found that women's pursuit of STEM graduate degrees is positively affected if they have a mother who is either a research scientist or a college teacher. Lovitts (2001) also identified a student's relationship with his or her mentor-advisor as key in the successful completion of an advanced degree. These studies support the idea that significant individuals can play an important role in women' decisions to pursue advanced STEM training.

Gender Differences in Access to Mentors

Mentorship is critical for women, particularly women entering male-dominated occupations (Dipboye,1987; Ragins & McFarlin, 1990; Ragins & Cotton, 1999; Blake-Beard, 1999; Queralt, 1982). Research indicates that women face different barriers to initiating mentor relationships than do men (Ragins & Cotton, 1991; Ragins, 1989). One barrier is a lack of mentoring opportunities for female students. A primary reason cited for this lack is the shortage of high-ranking

women in male-dominated organizations and occupations (Ragins & Cotton, 1991; Ely 1994, 1995). In addition, women in traditionally male occupations may be reluctant to initiate mentoring relationships with men for fear that others may view them as aggressive or construe their intent as a sexual in nature (Clawson & Kram, 1984; Ragins, 1989; Maccoby & Jacklin, 1974). As a result, women may be more likely than men to wait for a mentor to initiate the relationship for fear of being labeled as overly aggressive by others.

Due to the shortage of potential female mentors and because of gender-role expectations I predict that:

1. Female veterinary students will be more likely than male veterinary students to report that they do not have a mentor.

While not all students may perceive a need for mentoring (Rice & Brown, 1990), evidence indicates that a mentor is essential for women to overcome gender-related barriers in traditionally male disciplines and careers (Burke & McKeen, 1995; Noe, 1988; Ragins, 1989). Seymour and Hewitt (1997) state that the most often-reported need expressed by women students in science disciplines was to have a personal and supportive relationship with a faculty member. However, women in predominantly male settings often lack the same access to events and activities that their male colleagues enjoy. Activities, such as sports or after hours socializing, can lead to developing mentoring relationships or to informal mentoring opportunities (Ragins, 1989). These factors lead me to predict that:

2. Of the students who report not having a mentor, women will be more likely than men to express a desire for a mentor.

The shortage of female faculty in STEM disciplines, such as veterinary medicine, limits the number and diversity of potential female role models and mentors to which a student is exposed. Therefore, while male students can initiate mentoring relationships with someone of their own sex, women must often approach someone of the opposite sex. Given that more men than women hold positions of power and influence in veterinary medicine and the fact that women make up the majority of students who may be seeking a mentors, I predict that:

3. Of the students reporting that they have a mentor, female students will be less likely than male students to be in a same-sex mentoring dyad.

Gender Differences in Mentoring Experiences

Scholars have also begun to explore how the mentoring dyad's gender, race, and social class composition influences the mentoring process. While research indicates that individuals in organizations prefer to interact with those who are more similar to them in terms of demographic characteristics (Tsui & Gutek, 1999; Tsui, Egan, & O'Reilly, 1992), the limited number of female faculty in veterinary schools may constrain women students' ability to fully exercise this preference in relation to mentor choice. Mentoring research indicates that the mentoring dyad's gender composition will affect the mentoring experience and outcomes (Ragins, 1997; Ragins & Cotton, 1999). For example, Burke, McKeen and McKenna (1990) found that male mentors reported greater similarities to

male protégés than to female protégés. Similar research shows that both male and female protégés report being more comfortable with same-sex mentors (Sands, Parson, & Duane, 1992; Berg & Ferber, 1983) and they stay away from socializing with their mentor if they are of the other sex to avoid the perception of sexual liaisons (Ragins & McFarland, 1990). Since interpersonal comfort should serve to create a supportive and psychologically safe environment for the protégé I would expect to see higher levels of satisfaction and trust due to an increase in perceived similarity, based on sex. To test this I propose the following hypotheses;

4. Students in same-sex mentoring relationships will report greater satisfaction with their mentoring experience than students in cross-sex dyads.

5. Students in same-sex mentoring relationships will report higher levels of trust in their mentor than will students in cross-sex dyads.

Similarly, mentoring research predicts that female mentors in male-dominated organizations will, based on gender stereotypes, be perceived by male protégés to have less power and influence, and therefore less credibility as mentors (Ragins, 1997). To test this I propose the following hypothesis:

6. Male students with female mentors will be less satisfied with their mentoring relationship than any other dyad combination.

To investigate other qualitative differences in dyad composition I utilized Kathy Kram's (1985) work on mentor roles. Two main functions emerged from Kram's work. The first is the instrumental or career development function. This type of mentoring involves sponsorship, exposure and visibility, coaching, protection, and challenging assignments and tends to depend on a mentor's power and position in the organization or profession (Ragins & Cotton, 1999). This may take the form of letters of recommendation, assignments to visible roles within the college, or having the student accompany the mentor to a prestigious conference. The second type of mentoring, which Kram calls psychosocial, includes role modeling, acceptance, counseling, and friendship, and is dependent on interpersonal aspects of the mentoring relationship (Ragins & Cotton, 1999). Mentoring of this sort may include offering mentees a sympathetic ear or encouraging when they encounter professional obstacles. These functions proposed by Kram have been shown to be distinct and measurable (Ragins & McFarlin, 1990; Scandura, 1992; Tepper, Shaffer, & Tepper, 1996).

A mentor's position and perceived power in an organization will influence her or his ability to provide career development functions for protégés. In addition, Paludi et al. (1991) has shown that the protégé's gender influences how a mentor views the protégé. For example, male mentors perceive themselves as helping to shape the careers of their male protégés, but view their female protégés as needing remedial assistance (Paludi, DeFour, Craithwaite, Chan, Garvey, Kramer, Lawrence, & Haring-Hidore, 1991). Furthermore, in organizations with

few women, male mentors may be conditioned to see women as mothers and spouses rather than potential protégés (Ragins & Cotton, 1996). Since men hold the majority of senior positions in STEM education, and therefore have more power and influence than women have, I predict that:

7. Male students with male mentors will report more career development functions than will female students with male mentors.

8. Male students with male mentors will report more career development functions than will male students with female mentors.

9. Male students with male mentors will report more support and encouragement than will male students with female mentors.

Psychosocial functions address interpersonal aspects of the mentoring relationship that affect the protégé on a more personal level. For example, women in nontraditional disciplines, such as veterinary medicine, may seek mentors and role models who can guide them through such problems as combining work and family (Bizzari, 1995; Gilbert & Rossman, 1992). Based on the idea that protégés will perceive more similarities to same-sex mentors I would predict the following:

10. Students in same-sex dyads will report higher levels of psychosocial support than will students in cross-sex dyads.

Additional research indicates that a relationship characterized by large differences between power-related groups restricts the degree of role modeling (Ragins, 1997). Studies have shown that male protégés with female mentors rank their mentors lower as role models than any other type of gender dyad (O'Neill & Blake-Beard, 2002; Ragins & Cotton, 1999). Given that research indicates that role modeling is strongest in same-sex mentoring dyads I would predict that:

11. Students in same-sex dyads will report higher levels of role model functions than will students in cross-sex dyads.

12. Male students with female mentors will report lower levels of role model functions than will any other mentoring dyad.

The Effects of Organizational Context

Organizations are often important determinants of social identity in contemporary society (Wharton, 1992). In addition, an organization's demographic characteristics are likely to influence groups' relative value. Organizational demography researchers have long speculated that the overrepresentation of white men in positions of power may reinforce the devaluation of women (Konrad & Gutek, 1987; Ridgeway, 1988). Ely's (1994, 1995) study supported this idea. She found that junior women in male-dominated law firms were less likely than women in sex-integrated firms to view senior women as good role models. She explains these results by arguing that in male-dominated firms junior women

perceived that membership in their gender group was incompatible with membership in more powerful organizational groups. Ely states that as long as women are underrepresented in positions of power "sex may persist as a salient category with negative consequences for women lower down in the organization" (Ely, 1995, p.590). In addition, Dasgupta and Asgari (2004) showed that organizational demographics influenced the automatic stereotypical beliefs of students in male-dominated disciplines like science and math. Based on this research I propose the following hypotheses.

13. Satisfaction of male students with female mentors will increase with increasing numbers of tenured female faculty.

14. The level of role model functions reported by students that have a female mentors will increase as the number of tenured female faculty increases.

Overview of Veterinary Medical Education

Although the first Doctor of Veterinary Medicine degree was awarded in America by Cornell University in 1876, the first college of veterinary medicine was not established until three years later, in 1879, at Iowa State University. While the first woman graduated from an American veterinary college in 1903 most of the veterinary programs rarely accepted female students in the first half of the twentieth century (Association for Women Veterinarians, 1997). Those who did gain access to veterinary training did so through fathers who were in the profession. One of the last schools to integrate was the veterinary school at

Texas A&M University, which did not accept women until required to do so by law in 1963.

Currently there are approximately 9700 students enrolled at the 27 accredited colleges of veterinary medicine in the United States. Veterinary medicine is selective and prestigious (Blau & Duncan 1967). To become a doctor of veterinary medicine an individual must complete three or more years a preparatory work in math and science prior to competing for entrance into four years of highly-specialized professional training. On average there are 3.62 applicants for each available first-year student position. The average first year veterinary student is 24 years old and holds a bachelor degree with an overall GPA of 3.53.

Currently veterinary medicine is a rapidly feminizing field. After decades of consistent growth, male first-year student enrollment in North American veterinary medical colleges slumped from a high of 1483 in 1972 to a mere 932 in 2003. This occurred despite the construction of several new colleges of veterinary medicine and increased class sizes at existing schools. Although most of the educational programs for the health professions, including pharmacy and dentistry, experienced declines in male enrollment, the rate and degree of feminization of the veterinary profession surpassed all other health professions. For example, between 1960 and 1988, when women were making large in-roads into the health professions, women's representation in dentistry grew from 2.1% to 7.7%, female physicians grew from 6.7% to 17.3%, and veterinarians grew

from 1.8% to 20.8% (Bird, 1992). Currently women make up 70% of veterinary students and 36% of practicing veterinarians (Brown & Silverman, 1999). By 2015, the American Veterinary Medical Association predicts women will make up 78% of the professional student population and 67% of the practicing veterinarians (Brown, & Silverman, 1999). Yet, not unlike other professions, horizontal and vertical gender segregation persists (Curran, 1995; Daily, Certo, & Dalton 1999; Bickel, Wara, Atkinson, Cohen, Dunn, Hostler, Johnson, Morahan Rubenstein, Sheldon, & Stokes, 2002). For example, until 2003 there were no female deans of a veterinary college. At that time women comprised only 9% of the senior academic administrative positions; 14% of the full professor positions; 30% of associate professor positions; and 45%of the assistant professor positions (Association of American Veterinary Medical Colleges, 2003). Hence, while women are a majority of veterinary students, they remain significantly underrepresented among veterinary faculty and administrators.

Data and Methods

Data

Twenty of twenty-seven U.S. colleges of veterinary medicine participated in this project.[2] The participating colleges included both public and private institutions, located on urban and rural university campuses within seven of the eight geographic regions used in the Integrated Postsecondary Education Data System (IPEDS). In 2004, when the data from this study were collected,

[2] Three schools with response rates lower than 10% (5 or fewer surveys returned) were dropped from the analysis

veterinary student enrollment at the surveyed colleges ranged from 208 to 538, with a median of 319. Based on prior research indicating that students identify role models and mentors who influence their career choices approximately 2.5 years into their educational or professional training programs (Basco & Reigart, 2001), the student sample was limited to 1,490 third year students.

The total number of usable surveys was 644, representing 43% of the original survey population.[3] The individual-level data was derived from an 82-item questionnaire that included measures of mentoring functions and satisfaction, past and present experiences with mentoring, individual characteristics, career plans and goals, and in the case of individuals with multiple mentors, separate assessments for each relationship.

The final sample was 77% female (496 women and 148 men). The average age was 27 (range was 23 to 56 years). Fourteen percent of the respondents reported being a members of a racial or ethnic minority with the following break down: White (89%), American Indian/Alaskan Native (2.5%), Indian Asian (1.1%), Hispanic/Latino(a) (3.7%), Central/Southeast Asian (2.3%), Black/African-American/African (4.3%). A comparison of these results with veterinary college enrollment data collected by the Association of American Veterinary Colleges

[3] Due to restrictions of the Family Educational Rights and Privacy Act (FERPA) a sampling frame of all third year veterinary students could not be constructed in order to produce a random sample for analysis. Instead, a contact person at each college of veterinary medicine agreed to distribute and collect the survey instrument. Each college's response rate was influenced by the contact person's method of distribution (e.g. distribution through student mailbox, which always yielded a lower number of completed surveys or in class distribution). Response rates ranged from 10% to 89%).

(AAVMC) indicates that, demographically, this sample reflects the general veterinary student population (see table 2.1)

Table 2.1

Variable	Survey	AAVMC
Average age	**27**	**26.82**
Percent female	**77**	**73**
Percent Minority	**13.9**	**9.4**

Organizational level data was collected from various archival sources including college publications, web pages, professional journals, and professional organizations. In addition, the contact from the student survey, usually the Dean of Students, responded to a short, 16-item organizational questionnaire about theoretically important questions not available through archival research, such as each college's educational outcome goals and specific information about the college's mentoring practices.

Methods

Because the data consists of individuals nested within colleges, my primary method of data analysis was multivariate hierarchical linear modeling (HLM). This choice of analysis is grounded in the perspective that students will vary not only as individuals, but also as a function of their educational context. HLM allows for differences among the colleges and among the students within the colleges to be

incorporated into one model. See Bryk and Raudenbush (1992) for an explanation of this statistical method.

Estimating separate regression models for each level allowed me to specify how variables at one level affected relations at another level. Bernoulli models, which estimate the log odds as a function of individual and college characteristics, were used for analysis involving binary dependent variables, such as mentoring presence and gender composition of the mentoring dyad.

For the dependent variables of satisfaction with mentor, mentor functions, trust of the mentor, and the level of support and encouragement a student received from his or her mentor, I used continuous hierarchical linear analyses. All individual-level variables are grand mean centered, thus the intercept represents the adjusted average of the dependent variable after controlling for all covariates.

Dependent Variables

In order to ensure that the students understood clearly what a mentor was, I included the following description in the survey instrument. “We are defining a mentor–protégé relationship as one that goes beyond normal supervisory guidance. It is a relationship where someone invests time, know how and effort in increasing and improving your growth, knowledge, and skills. A mentor is someone with more experience in veterinary medicine whom you turn to for emotional support, career counseling, advice or support about educational or professional decisions. A mentor may be a more advanced student, a

graduate/teaching assistant, a faculty member, or someone who works in veterinary medicine outside of academia". Two of the principle questions this study assesses are whether students' access to mentoring relationships differs by sex and whether the mentoring experience itself differs by sex. To measure this, I used several dependent variables, described below (see Appendix 2-A for an inventory of all observed variables).

Currently in a mentoring relationship: Students were asked if they currently had someone they regarded as a mentor. If they had more than one mentor they were asked to think of the individual that they felt had the most influence on their educational and career choices. The variable is coded 1=currently has a mentor, 0=does not have a mentor.

Desire for a mentoring relationship: Students who reported that they were not currently in a mentoring relationship were asked if they would want to become involved in a mentor–protégé relationship if the opportunity existed. The variable is coded 1=yes, 0=no.

Mentor dyad composition: A variable called *same-sex* was created if the student reported that the sex of their mentor was the same as their own sex. The variable is coded 1=same sex dyad, 0=cross-sex dyad. Individual variables for each mentoring dyad combination were also created for more detailed analysis. Each of these variables is coded 1=if the mentor-protégé dyad combination equals the description of the variable, 0=all other dyad combinations.

Satisfaction with mentor: The survey asked respondents to rate their level of agreement with ten items related to mentor satisfaction. Responses ranged from 1 (strongly disagree) to 4 (strongly agree). Several items were included that were reverse coded to reduce the risk of response set bias. The mean of the summed results were used to create a scale. (see Appendix 2-B for items and alpha).

Mentor function scales: A fifteen-item scale measured the extent to which a mentor demonstrated three particular mentor functions toward the protégé. These were, career development, psychosocial support, and role modeling. Responses ranged from 1 (not at all) to 5 (a very large extent). I used the mean of the summed results to create a scale. (see Appendix 2-B for items and alpha).

Mentor trust scale: I conducted principle component analysis (PCA) of thirty individual, pre-tested variables to determine thematic clustering.[4] This analysis produced an additional scale that measures a student's trust of his or her mentor. This scale consists of 10 questions that operationalize trust with the possible responses of 1 (strongly disagree) to 4 (strongly agree). Some items were reverse coded to reduce the risk of response set bias. The mean of the summed results was used to create a scale. (see Appendix 2-B for items and alpha).

[4] See Appendix B for each item's original source.

Support and encouragement scale: I designed the mentor support and encouragement scale using pre-tested questions from multiple sources.[5] The PCA of these individual variables produced a seven item scale that operationalized the extent to which a mentor demonstrated supportive and encouraging behavior toward the student. The scale used a four point response format ranging from 1 (strongly disagree) to 4 (strongly agree). As noted on previous scales, reverse coding was used on several items to reduce the risk of response set bias. Several of the survey items were reverse col used the mean of the summed results to create a scale. (see Appendix 2-B for items and alpha).

Independent Variables

The key independent variables at the individual-level include characteristics that are theoretically linked to mentoring and educational outcomes and that similar research has employed as control variables. The following dichotomous variables are included: sex (1=female), marital status (1=single), having financial dependents including children, spouse, or other family members (1=has a dependent). Based on research indicating that individuals with prior mentoring experience may have better strategies for obtaining a mentor and may have more accurate perceptions about mentoring (Ragins & Cotton, 1991), I included a variable that measures whether a student reported a past mentoring relationship (1=past mentoring experience).

[5] See Appendix B for each item's original source.

Age is measured in years and *Length of mentoring relationship* is measured in months. In addition, I measured the *level of parents' education* using three dummy variables: high school diploma or less, college degree, advanced degree. High school diploma or less is the omitted category.

Organizational Variables

I calculated college-level variables from 2004 Integrated Postsecondary Education Data System (IPEDS) and AAVMC data that measure all members of each college regardless of whether or not they were survey respondents. In order to examine how the organizational context influenced the likelihood of having a mentor, as well as the mentoring experience, the following aspects of each college were measured: percentage of female faculty with tenure, percentage of female students, and the total size of the university.

Results

Descriptive Results

Table 2.2 lists the means, standard deviations, and *p*-values for the individual and college-level variables used in this study. Overall, 58% of the students surveyed indicated that they currently have mentors. Although it did not reach the level of significance, more male students than female students reported a mentoring relationship (63% versus 57%) and, on average, they reported that they had been in their current relationship approximately one year longer than female students had been. The students who currently have mentors were more likely than their non-mentored colleagues to indicate one or more past mentoring

relationships (60% versus 50%). Of the students reporting they were not currently in a mentoring relationship, women were significantly more likely than men to state that they would like to be in a mentoring relationship if the opportunity existed (34% to 21%).

Men were significantly more likely than women to be in a same sex mentoring dyad (76% of the men compared to 40% of the women were currently in same sex mentoring relationships) and most students, (87%), reported having a mentor of the same race. Women were significantly more satisfied than men with their current mentoring relationships and rated their mentors higher for psychosocial support, trust, encouragement, and as role models than did their male colleagues.

Overall, these results indicate that men and women do experience significant differences in mentoring opportunities and experiences. In order to understand in greater detail what factors contribute to these differences we must now examine the regression analysis.

Analysis of Multivariate Hierarchical Linear Models

The first step required for the analysis of each dependent variable is estimating of a baseline model containing only individual-level predictors. Each baseline model will show the effects of the individual-level characteristics on the dependent variable. All individual characteristics are grand mean centered, thus,

the intercept represents the adjusted average of the dependent variable after controlling for all covariates.

Individual-level results for binary hierarchical linear models

Table 2.3 shows the results of the Bernoulli models used to estimate the odds of a student being in a mentoring relationship, the odds of a student wanting to be in a mentoring relationship if they are not in one currently, and the odds of a student having a mentor of the same sex. For ease of interpretation the results are reported as odds ratios. Odds ratios measure the odds of being in one category compared to another. Odds ratios of less than one indicate a decreased chance of an event occurring, odds ratios greater than one indicate a greater chance of the event occurring, and odds equal to one indicate no effect.

Sex differences in having a mentor: As predicted, women are significantly less likely than men to have a mentor (Table 2.3, column 1). Additionally, the analysis shows that having a history of mentoring increases the odds of having a current mentoring relationship by 158%.

Sex differences in the desire to have a mentoring relationship: Although the women in this study were less likely to have a mentor, they were more likely to express a desire for one. Of the students who reported they did not have mentoring relationships, the odds of wanting a mentoring relationship, if given the opportunity increased by 243% if a student was female. Additionally, students who reported a history with mentoring were 120% more likely than those who did

not have a past mentoring relationship to want a mentor now. Overall, these results indicate that students do see mentoring as a valuable resource.

Sex differences in the odds of having a same-sex mentor. The results (Table 2.3, column 3) show that the odds of having a same sex mentor are 78% less for female students than for male students. Interestingly, being single, compared to married or partnered, increased the odds by 67% that a student would have a mentor of the same sex. This seems to support the idea that protégés may manage their mentoring relationships to limit the appearance of sexual impropriety. Thus, protégés who are single may be more comfortable with their mentoring relationships if they select same sex mentors.

Summary: Significant sex differences exist in students' access to mentoring relationships. The results discussed above show that female students are less likely than male students to have mentoring relationships or to have a mentor that is her sex. In addition, of the students who do have mentors, women are more likely than men to say they would like a mentor. Additional findings from this analysis show that having had previous mentoring relationships increases the odds that both males and females will have a mentor currently. The next section explores how dyad composition affects the qualities and functions of a mentoring relationship.

Individual-level results for continuous hierarchical linear models

Table 2.5 shows the effects of the individual-level variables on the following dependent variables: student satisfaction with her or his mentor; the three mentor

functions of career development, psychosocial support, and role modeling; student trust; and the level of support and encouragement a student receives from his or her mentor.

Satisfaction with mentor: Hypothesis 4 predicted that, overall, students whose mentor was the same sex as the student would report higher levels of satisfaction. However, the regression analysis does not support this prediction. The results indicate that the same-sex dyad of male mentor–male protégé shows significantly less student satisfaction than does the omitted cross-sex dyad of male mentor–female protégé. The female–female dyad was not significantly different from the male mentor–female protégé dyad.

The results supported Hypothesis 6, which predicted that male students with female mentors would be the least satisfied dyad combination (see Table 2.5, column 1). It appears that, overall, men are less satisfied with their mentoring experience than are women regardless of the mentoring dyad's sex composition. However, the degree of men's dissatisfaction is highest in cross–sex dyads.

Trust of mentor: The regression results for Hypothesis 5, which predicted that students in same-sex mentoring dyads would report higher levels of trust, were similar to the results for student satisfaction (Tables 2.5, column 2). The male–male dyad was negatively associated with mentor trust compared to the male mentor–female student dyad. The female–female dyad did not reach significance. The coefficient for males with female mentors was the most negative.

Career Development: In Hypothesis 7, I predicted that the male–male dyad would, in comparison to the male mentor–female student dyad, report more career development. In addition, Hypothesis 8 predicted that the male-male dyad would also report greater career development than would the female mentor-male student dyad. The analysis showed no significant difference in career development functions between any of the mentoring dyads. Therefore, neither Hypotheses 7 nor 8 could be supported.

Support and Encouragement: In Hypothesis 9 I predicted that the male–male dyad would, in comparisons to the male mentor–female student dyad, be positively associated with mentor support and encouragement. This hypothesis is not supported by the regression results. Of the two, only the male mentor–female student dyad is positively associated with mentor support and encouragement (Table 2.5, column 4).

Psychosocial support: Hypothesis 10 predicted that students in same-sex dyads would report higher levels of psychosocial support. However, the regression results show no significant difference in the amount of psychosocial support students reported based on dyad combination. Interestingly, single students reported significantly less psychosocial support than did married students. Perhaps this result indicates that single students maintain a psychological distance from their mentors in an attempt to manage the perceptions others may have of the mentoring relationship.

Role modeling: I predicted that, based on a sense of shared characteristics, same sex dyads would be positively associated with higher levels of role modeling functions. However, the results indicate that the male–male dyad is negatively associated with role modeling while for the female–female dyad, role modeling is not significantly different from the omitted category of male mentor–female protégé (Table 2.5, column 6).

There was strong support for Hypothesis 12, which predicted that male students with female mentors would report lower levels of role modeling than would any other dyad combination. Male students rated their female mentors significantly lower as role models than any other dyad combination.

The effects of organizational context: Tables 2.4 and 2.6 show the results for the full regression models, which include individual and organizational level variables, for Hypotheses 1 through 12. The effects of the individual-level variables included in the baseline models do not change substantially with the inclusion of the college characteristics. Thus, Hypothesis 13, which predicted that the satisfaction of male students with female mentors would increase with increasing numbers of tenured female faculty and Hypothesis 14, which predicted that the level of role model functions reported for female mentors would increase as the number of tenured female faculty increased are both rejected.

Summary: Although there appear to be significant sex differences in mentoring qualities, many of the hypotheses for same-sex dyads were not supported. In

general, female students with female mentors were not significantly different from the omitted category of female students with male mentors. However, male students were the least satisfied with their mentoring experience whether their mentor was male or female.

Discussion

Mentoring has been suggested as an important component for women's success in STEM disciplines. In response, most colleges and universities across the nation have invested in the development of some type of mentoring program for STEM students with a focus on women and minorities.[6] Yet the results of this study indicate that while female students want to be in a mentoring relationship more than their male colleagues, they are still less likely than men to have a mentor. These results are in agreement with recent mentoring research that indicates that women experience greater barriers to developing mentoring relationships than do men (Ragins & Cotton , 1991, 1999).

As discussed previously, mentors may provide three types of behaviors or functions: (1) career development functions; (2) psychosocial functions; and (3) role modeling functions. The results of this study indicate that the degree to which students receive these functions from their mentors is influenced by the

[6] Analysis not reported shows that all but one of the colleges in this study has a formal mentoring program yet only 7.9% (7.1% male and 8.9% female) of the respondents who reported having a mentor met their mentor through that program. In addition, while 70% of the colleges responded that mentoring was very important for their students this attitude did not translate into an effective mentoring program from the student's perspective. The average student rating for effectiveness of their schools mentoring programs was only 2.2 out of a 4 point scale, an effectiveness rating of only 55%.

composition of the mentoring dyad. However, contrary to current mentoring theory, which predicts that students in same-sex mentoring dyads should receive the most benefit from their mentoring relationships, the results of this study indicate that positive mentoring outcomes may be more dependent on which groups are perceived by others in the organization to have power, rather than simple dyad composition. Overall, women with male mentors reported the highest levels of mentor satisfaction, trust, role modeling and encouragement than any other dyad combination. These results may be partly explained by research that shows that women compare themselves to other women rather than to men and, therefore, have lower expectations for rewards than do men in similar circumstances (Crosby, 1982). Other explanations may be that women report more support and are more appreciative of the mentoring they do receive compared to men.

In comparison to female students, male students were far less satisfied and reported significantly less mentor satisfaction, trust, encouragement, and role modeling regardless of the mentors' sex. Although the relatively small sample size requires cautious interpretation, the results for male students with female mentors were consistently more negative than for male students with male mentors. These findings support the theoretical perspective that minority mentors have less power than majority mentors and may be less able to provide for their protégés development needs (Ragins, 1997). In addition, these findings may reflect personality differences among men who choose female mentors (Infante, 1990).

A somewhat unexpected finding was the strongly negative role modeling results that male students with female mentors reported, which presented a strong contrast to the strongly positive results female students with male mentors described. One possible explanation may be that, in the context of a feminizing field, women faculty are not seen to be as powerful as men. As a consequence, both women and men may look to men more than women for guidance and role modeling. This analysis is supported by a number of studies documenting that men enjoy more power in the workplace than do women (Kanter, 1977; Reskin & McBrier, 2000; Tomaskovic-Devey, 1993).

Finally, given the rapid feminization of veterinary colleges, it is important to consider how the larger organizational context affects the mentoring relationship. Although the organizational-level results for this study did not reach significance the effects of the percent female faculty variable are in the predicted direction for the role modeling dependent variable.

While this study demonstrates that male and female students in traditionally male professions have different experiences with mentoring, the results also offer some insights into how these imbalances can be addressed. For example, the results show strong evidence that a history of mentoring increases the odds that a student will have a current mentoring relationship. These findings imply that programs that initiate mentoring relationships with students earlier may help them develop an appreciation of the benefits of mentoring or skills they can use to initiate mentoring relationships later, or both. Programs that begin in high school

or early college may offer greater rewards than formal college programs that commence at more advanced stages of a student's academic training.

Limitations and Future Research: This study has several limitations, including how generalizable the results are to students in other STEM disciplines. Additionally, the self report measures used in this study are susceptible to bias. A more accurate measure may include data collected from mentors as well as protégés. Future research could explore how the mentor's level of prestige, experience with mentoring and their perceptions of the student protégé influence the qualities of the mentoring experience.

A second limitation is the relatively small sample of male protégés with female mentors. Although it is difficult to find many female mentor–male protégé dyads in male-dominated disciplines, future research efforts should consider methods to increase the numbers of respondents of this dyad so that we may better explore the interpersonal dynamics of these relationships.

Finally, future research should examine the long term effects of mentoring relationships. If mentoring is a social resource for students it would be beneficial to know how students use this resource in their careers and if over time mentoring during a students training benefits the careers of men more than it does the careers of women.

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CHAPTER TWO

TABLES

TABLE 2.2-A: Means and Standard Deviations for Dependent Variables

	Sample Mean (S.D.)	Women Mean (S.D.)	Men Mean (S.D.)	*p*-Value
Currently in a Mentoring Relationship (1=yes)	0.58	0.57	0.63	.121
Desire for a Mentoring Relationship (1=yes)	0.31	0.34	0.21	.169
Career development scale	3.71 (.783)	3.71 (.796)	3.75 (.747)	.840
Psychosocial Scale	3.43 (1.10)	3.46 (1.13)	3.33 (1.01)	.310
Role modeling Scale	3.76 (.771)	3.83 (.753)	3.55 (.798)	.003
Satisfaction with mentor scale	3.69 (.308)	3.71 (.303)	3.62 (.320)	.013
Trust of mentor Scale	3.69 (.341)	3.72 (.334)	3.64 (.356)	.014
Support and encouragement scale	3.33 (.458)	3.35 (.448)	3.27 (.481)	.101
Same-sex dyad (1=same-sex)	0.49	0.40	0.75	.000

TABLE 2.2-B: Means and Standard Deviations for Individual-level Independent Variables Total Sample (N=629)

	Sample Mean (S.D.) (N=629)	Women Mean (S.D.) (N=483)	Men Mean (S.D.) (N=146)	*p*-Value
Age (years)	27.41 (3.94)	27.42 (4.07)	27.40 (3.50)	.964
Dependents (1=yes)	0.09	0.07	0.16	.003
Fathers highest educational level (years)	15.88 (2.25)	15.86 (2.20)	15.95 (2.43)	.602
Mothers highest educational level (years)	15.18 (1.83)	15.23 (1.84)	15.00 (3.33)	.379
Past mentoring (1=yes)	0.50	0.51	0.50	.919
Single	0.46	0.47	0.45	.706

TABLE 2.2-C: Means and Standard Deviation for Individual Independent Variables Mentored Sample (N=366)

	Sample Mean (S.D.) (N=366)	Women Mean (S.D.) (N=274)	Men Mean (S.D.) (N=92)	*p*-Value
Age (years)	27.37 (3.74)	27.24 (3.69)	27.37 (3.89)	.912
Dependents (1=yes)	0.08	0.06	0.19	.003
Duration of current mentoring relationship (months)	79.19 (82.23)	74.96 (78.33)	92.49 (92.26)	.084
Fathers highest educational level (years)	15.99 (2.22)	15.89 (2.11)	16.31 (2.51)	.191
Mothers highest educational level (years)	15.21 (1.76)	15.29 (1.69)	14.98 (1.99)	.747
Past mentoring (1=yes)	0.60	0.62	0.57	.422
Single	0.48	0.48	0.49	.903

TABLE 2.2-D: Means and Standard Deviation for College-Level Independent Variables (N=17)

	Mean	Standard Deviation
Percent Female Faculty with Tenure	13.38	3.60
Percent Female Students	71.23	10.83
Size of University (Number of students)	25,661.65	10424.91

TABLE 2.3: Baseline Model for the Presence of a Mentor, Desire for a Mentor, and the Mentor Dyad Combination

Individual-level Variables	Odds Ratio of Having a Mentor	Odds Ratio of Desiring a Mentor	Odds Ratio of a Same-Sex Mentoring Dyad
Fixed Effects			
Intercept	1.434 **	4.622 ***	0.954
Independent Variables			
Age	0.997	0.957	1.040
Sex	0.718+	3.430***	0.219***
Dependents	1.034	0.722	1.354
Single	1.243	0.696	1.673*
Mother–College	1.131	1.023	0.614+
Mother–Advanced	1.069	1.203	0.880
Father–College	1.378	1.409	0.966
Father–Advanced	1.153	1.084	0.926
Past Mentoring	2.581***	2.204*	0.785
Random Effects			
Variance Component	0.14345	0.00045	0.03450
X2	33.84	10.93	15.29
df	16	16	16
p Value	0.006	>.500	>.500
(N=629)			

+p<.10 * p<.05 **p<.01 *** p,.005

TABLE 2.4: Full Model for the Presence of a Mentor, Desire for a Mentor, and the Mentor Dyad Combination

	Odds Ratio of Having a Mentor	Odds Ratio of Desiring a Mentor	Odds Ratio of a Same-Sex Mentoring Dyad
Intercept	1.965	8.164	1.845
Individual-level Variables			
Independent Variables			
Age	0.999	0.959	1.041
Sex	0.714	3.517***	0.215***
Dependents	1.021	0.686	1.401
Single	1.250	0.688	1.698*
Mother–College	1.140	1.023	0.611+
Mother–Advanced	1.088	1.212	0.867
Father–College	1.344	1.427	0.947
Father–Advanced	1.151	1.119	0.921
Past Mentoring	2.601***	2.255*	0.789
College-level Variables			
Size of College	1.0000	0.999	0.999
Percent Female Tenure	0.1.01	0.990	1.037
Percent Female Students	0.988	0.994	0.986
Random Effects			
Variance Component t	0.166	0.059	0.031
X2	29.17	10.96	13.22
df	13	13	13
P Value	0.006	>.500	0.431
(N=	629	629	

+p<.10 *p<.05 **p<.01 *** p,.005

TABLE 2.5: Baseline Model Mentoring Experience

Individual-level Variables	Satisfaction with Mentor	Trust of Mentor	Career Development Functions	Support and Encouragement	Psychosocial Support	Role model Functions
Intercept	3.696***	3.698***	3.71***	3.33***	3.429***	3.76***
Independent Variables						
Duration of Relationship	-0.000	0.000	0.000	0.000**	0.002***	0.000
Age	-0.002	0.000	-0.015	-0.010	0.013	-0.020+
Dependents	-0.020	-0.026	-0.039	-0.137	-0.077	-0.116
Single	0.014	0.020	-0.110	-0.008	-0.237*	-0.103
Mother–College	-0.003	0.035	0.033	0.054	0.244+	0.030
Mother–Advanced Degree	-0.040	-0.095*	-0.124	-0.075	-0.091	-0.122
Father–College	-0.037	-0.016	-0.114	-0.087	-0.105	0.002
Father–Advanced Degree	0.078*	0.069	0.109	0.006	-0.042	0.130
Male–Male	-0.090*	-0.102*	0.013	0.163	-0.085	-0.228*
Male Mentor–Female	-----	-----	-----	0.250*	-----	-----
Female–Female	-0.050	-0.040	-0.106	0.179	0.082	0.003
Female Mentor–Male	-0.194**	-0.168*	-0.241	-----	-0.321	-0.514***
Random Effects						
Variance Component	0.0000	0.001	0.00032	0.001	0.000	0.000
X2	15.08	15.72	12.16	18.10	13.75	12.38
df	16	16	16	16	16	16
p Value	>.500	>.500	>.500	0.318	>.500	>.500
(N=366)						

+p<.10 * p<.05 **p<.01 *** p,.005

TABLE 2.6: Full Model Mentoring Experience

	Satisfaction with Mentor	Trust of Mentor	Career Development Functions	Support and Encouragement	Psychosocial Support	Role model Functions
Intercept	3.849***	3.71***	3.75***	3.694***	3.607***	4.25***
Individual-level Variables						
Independent Variables						
Duration of Relationship	-0.000	0.000	0.000	0.0007**	0.002***	0.000
Age	-0.002	0.000	-0.015	-0.010	0.013	-0.020+
Dependents	-0.025	-0.021	-0.037	-0.131	-0.076	-0.113
Single	-0.011	0.022	-0.110	-0.010	-0.237	-0.103
Mother–College	-0.001	0.034	0.031	0.053	0.244	0.030
Mother–Advanced Degree	-0.036	-0.097*	-0.125	-0.077	-0.089	-0.116
Father–College	-0.045	-0.015	-0.115	-0.095	-0.119	-0.028
Father–Advanced Degree	0.077*	0.069	0.105	0.004	-0.044	0.123
Male–Male	-0.094*	-0.101 *	0.007	0.148	-0.087	-0.237*
Male Mentor–Female	-----	-----	-----	0.239*	-----	-----
Female–Female	-0.045	-0.043	-0.110	0.166	0.075	0.009
Female Mentor–Male	-0.182**	-0.170*	-0.244		-0.315	-0.495**
College-level Variables						
Size of College	0.000	-0.000	0.000	-0.000	0.000	0.000
Percent Female Students	-0.001	-0.000	-0.00	-0.004	-0.020	-0.009
Percent Female Tenure	-0.002	0.004	0.001	0.003	0.005	0.010
Random Effects						
Variance Component	0.0002	0.001	0.004	0.003	0.008	0.000
X2	13.03	14.13	12.10	15.99	13.54	9.21
df	13	13	13	13	13	13
p Value	0.445	0.364	>.500	0.249	0.407	>.500
(N=366)						

+p<.10 * p<.05 **p<.01 *** p,.005

CHAPTER 2

APPENDIX

Appendix 2.2-A - Inventory of Observed Variables

Name	Description
Background Characteristics	
Sex	= 1 if respondent is female; 0 otherwise
Age	= age at time of survey; 2004 minus year of birth
Single	= 1 if respondent is single; 0 otherwise
Dependents	= 1 if respondent has children or other financial dependents; 0 otherwise
Mother–College	= 1 if mother has bachelor degree; 0 otherwise
Mother–Advanced	= 1 if mother has an advanced degree; 0 otherwise
Father–College	= 1 if father has bachelor degree; 0 otherwise
Father–Advanced	= 1 if father has an advanced degree; 0 otherwise
Mentoring History	
Currently mentoring	= 1 if respondents reports that he or she is currently in a mentoring relationship, 0 otherwise
Past Mentoring	= 1 if respondent reports a past mentoring relationship; 0 otherwise
Not currently mentored	= 1 if respondent reports no mentor but would like to become involved in a mentoring relationship if the opportunity existed
Length of Relationship	= number of months respondent has known current mentor
Mentoring Experience	
Career Development Scale	Respondents score on scale
Psychosocial Scale	Respondents score on scale
Role model Scale	Respondents score on scale
Satisfaction Scale	Respondents score on scale
Trust Scale	Respondents score on scale
Mentor Support and Encouragement Scale	Respondents score on scale
Mentoring Dyad Composition	
Same Sex	= 1 if respondent and mentor are the same sex; 0 otherwise
Male–Male	= 1 if respondent is male and reports a male mentor
Male–Female	= 1 if respondent is female and reports a male mentor
Female–Female	= 1 if respondent is female and reports a female mentor
Female–Male	= 1 if respondent is male and reports a female mentor
Organizational Characteristics	
Size of University	The number of students enrolled at the University in 2004
Percent Female Tenure	Percent of veterinary faculty that is tenured and female
Percent Female Students	Percent of veterinary students that are female

APPENDIX 2.2-B

Scales Used in the Study

Mentor Satisfaction Scale

The mentor satisfaction scale was adapted from Ragins and Cotton (1999). The scale used a four point response format ranging from 1 (strongly disagree) to 4 (strongly agree). $\alpha = .80$

A) The mentor that is currently most important to me is respected for their professional competence.

B) My current mentor is a good role model for students like me.

C) My mentor is someone I am satisfied with.

D) My current mentor is personable and easy to work with.

E) My mentor is particularly helpful to students of my gender.

F) My mentor has been effective in his/her role.

G) My mentor fails to meet my needs.

H) My mentor disappoints me.

I) The relationship with my mentor has grown to be special.

J) I like my mentor.

Mentor Functions Scale

The three mentor function subscales were adapted from Scandura and Ragins (1993). The scale used a five point response format ranging from 1 (not at all) to 5 (a very large

extent). The psychosocial subscale consisted of items (E, G, J, L, and O) α= .89. The career development subscale consisted of items (A, B, C, D, F, and N) α= .80. The role model subscale consisted of items (H, I, and M) α= .73. Item K was dropped from the role model subscale when it failed to load at an eigen value above .6.

A) My mentor takes a personal interest in my career.

B) My mentor has placed me in important assignments.

C) My mentor gives me special coaching.

D) My mentor advised me about career opportunities.

E) I share personal problems with my mentor.

F) My mentor helps me coordinate professional goals.

G) I socialize with my mentor after school.

H) I try to model my behavior after my mentor.

I) I admire my mentor's ability to motivate others.

J) I exchange confidences with my mentor.

K) I respect my mentor's knowledge of the veterinary profession.

L) I consider my mentor to be a friend.

M) I respect mentor's ability to teach others.

N) My mentor has devoted special time and consideration to my career.

O) I often go to lunch with mentor.

Mentor Trust Scale

The mentor satisfaction scale was designed using pre-tested questions from multiple sources. The scale used a four point response format ranging from 1 (strongly disagree) to 4 (strongly agree). α =.90

Q42. My mentor offers a listening ear when I need it. (5)

Q46. My mentor is very approachable. (4)

Q49. I feel my mentor knows me as an individual. (4)

Q53. I feel my mentor respects me. (2)

Q54. I feel I can trust my mentor. (2)

Q55. I feel I can be honest with my mentor. (2)

Q56. I respect and admire my mentor. (1)

Q57. My mentor conveys empathy for any concerns and feelings I discuss with him/her. (1)

Q58. My mentor gives me individual encouragement. (3)

Q59. I know my mentor will keep our discussions confidential. (2)

1-Armstrong, S.J., Allinson, C.W., & Hayes, J. (2002). Formal mentoring systems: An examination of the effects of mentor/protégé cognitive styles on the mentoring process. *Journal of Management Studies 39*, 1111-1137

2-Fullerton, H. (Ed.), (1998). Facets of mentoring in higher education. *SEDA* paper 103. Staff and Educational Development Association.

3-Ragins, B.R. (1997). Diversified mentoring relationships in organizations: A power perspective. *Academy of Management Review, 22*, 482-521.

4-Shellito,C., Weissmann, G., Mueller-Solger, A., & Davis, W (2001). Successful mentoring of undergraduate researchers: Tips for creating positive student research experiences. *Journal of College Science Teaching, 30*, 460-464

5-Simpson, N. (1984). The mentor protégé relationship in professional psychology: A survey of faculty and student attitudes. Paper presented at the Southeastern Psychological association March 28-30, 1984.

Support and Encouragement

The mentor support and encouragement scale was designed using pre-tested questions from multiple sources. The scale used a four point response format ranging from 1 (strongly disagree) to 4 (strongly agree). $\alpha = .79$

Q31. If I do well, my mentor always lets me know. (3)

Q33. I feel my mentor takes an interest in my future. (3)

Q36. My mentor works with me to find solutions to problems I may face. (3)

Q40. My mentor encourages me to find solutions to my own problems. (3)

Q44. My mentor offers constructive critical feedback. (3)

Q47. My mentor stays current with my progress. (2)

Q60. I get advice on how to balance my responsibilities and achieve professional goals. (1)

1-Ragins, B.R. (1997. Diversified mentoring relationships in organizations: A power perspective. *Academy of Management Review, 22*, 482-521.

2-Shellito,C., Weissmann, G., Mueller-Solger, A., & Davis, W (2001). Successful mentoring of undergraduate researchers: Tips for creating positive student research experiences. *Journal of College Science Teaching, 30*, 460-464.

3-Simpson, N. (1984). The mentor protégé relationship in professional psychology: A survey of faculty and student attitudes. Paper presented at the Southeastern Psychological association March 28-30, 1984.

Chapter Three

Second Manuscript

THE PURSUIT OF GRADUATE TRAINING: THE ROLE OF SELF, OTHERS, AND THE ORGANIZATION IN SHAPING EDUCATIONAL AND CAREER ASPIRATIONS

Introduction

For over three decades, research has focused on gender inequality in science, technology, engineering and math (STEM). In 1965, when sociologist Alice Rossi asked "Why So Few?" women made up a little more than one quarter of the biologists and mathematicians, but only 9% of the chemists, 4% of the physicists and less than 1% of engineers (Raymen & Brett, 1995). According to the National Science Foundation (2004) by 2001 women earned slightly over half of the bachelor's degrees in the combined STEM disciplines: 49% in agricultural sciences; 59% in biology; 27% in computer science; 40% in earth, atmospheric, and ocean sciences; 48% in mathematics; 42% in the physicals sciences; 77% in psychology; 55% in social sciences; and 20% in engineering (National Science Foundation, 2004). Despite this increase in the number of women earning baccalaureate degrees in sciences and engineering, women still do not seek advanced training in STEM at rates comparable to their male counterparts. More women than men end their educations at the baccalaureate level, and the difference is especially pronounced in science and engineering, where women earn only 46% of first-professional degrees, 44% of master's degrees and 37% of doctoral degrees (National Science Foundation, 2004).

This uneven pattern of long term educational persistence across disciplines is significant not only because different fields of study and levels of education have access to specific opportunities and rewards in the labor market (Grubb, 1992; Perna, 2005) but also, as more women than men seek college educations, this pattern of occupational segregation impedes our nation's ability to meet the growing human resources needs in research and development, academic science, and professional leadership in the STEM professions which are powerful drivers of the national economy (Land of Plenty, 2000). The reality is that a quarter of the present science and engineering workforce is over 50 years old and will retire by the end of this decade (National Science Board, 2000). This makes the retention of women and minorities in the STEM "pipelines" a national imperative.

This study's goal is to develop an understanding of how women and men with histories of success in STEM disciplines differ, by gender, in their pursuit of graduate training. In particular this study examines: (1) how individual characteristics influence women's and men's career intentions; (2) sex differences in the influence of external forces, such as parents and mentors; and (3) the effects of the educational institution's organizational context on individual career choices. The data for this study came from my own survey of third year veterinary medical students at 23 of the 27 U.S. veterinary colleges. The unit of analysis is the student, nested within a college of veterinary medicine.

Literature Review and Hypotheses

While a review of the literature shows a plethora of research on reasons why undergraduate students persist or leave STEM majors, fewer studies address students'

educational persistence in science and engineering after the undergraduate years. The paucity of research that does look at graduate education in STEM focuses largely on individual-level characteristics. Although this can offer some insight into why gender inequality in the STEM disciplines remains, it is also important to examine the structural characteristics of traditionally male professions such as STEM. Many researchers argue that in traditionally masculine occupations the embedded nature of gender becomes invisible resulting in decisions that disadvantage women and minorities already in science and engineering occupations. When embedded gender disparity becomes invisible, it may also lead to decisions that skew how male and female students in STEM disciplines view their career opportunities and how significant individuals in students' lives, such as parents and mentors, regard their opportunities as well. Consequently, it may bias the advice they give to students' about their educational and career choices (Merton, 1968; Valian, 1998)

Background

No one disputes a progressive and persistent underrepresentation of women in STEM disciplines and careers (National Center for Education Statistics, 2001). The problem is progressive in the sense that the further along the STEM pipeline one goes the fewer women there are and persistent since, despite over three decades of research into issue of gender inequality in STEM, the gender imbalance of STEM has not ended (Cronin & Roger, 1999). Initially, researchers focused on differences between men's and women's innate abilities in science and in their educational preparation. These studies showed that the intellectual caliber of men and women entering science is similar, as measured by standardized test scores or prior academic achievements

(Seymour & Hewitt, 1997; Eisenhart & Finkel, 1998). In addition, research has shown that the number of college prep classes taken in high school is strongly predictive of choosing a STEM major (Sax, 1996; Goodman Research Group, 2002), and there appears to be little difference between men and women in science majors and the number or quality of college prep courses (NSF 2000). Seymour and Hewitt's (1997) pivotal research found no real differences in high school preparation, ability, or effort expended among undergraduate students who stay in science versus those who leave, which has all but put to rest the debate about sex differences in innate ability and high school preparation.

Given that women are equally, or better, prepared than men for careers in STEM, scholars have begun to examine other factors that may cause women to leave these disciplines at a higher rate than men. While a number of studies suggest that the educational climate of STEM is discouraging for all students, there are indications that it has a stronger negative impact on individuals who already feel that they do not belong there such as women and minorities (Cross & Vick, 2001). Brainard and Carlin (1998) found that college women in undergraduate science and engineering majors reported greater barriers blocking their route to degrees as they progressed in their disciplines. Twenty percent of freshman reported no barriers, but only 3% of seniors reported no barriers. In addition to a perceived increase in barriers to academic success, there is substantial evidence that, once in college, a woman's perception of her academic and intellectual abilities drops dramatically, whereas a male student's perception of ability does not (McIlwee & Robinson, 1992; Arnold, 1993). These gender differences do not diminish with time or educational experience. Studies on female graduate students in

STEM report that women commonly endure psychological alienation and lowered self-esteem in response to their graduate school experiences and that these feelings are significant factors in their decisions to leave (Seymour & Hewitt, 1997; Lovitts, 2001). One possible explanation for this decline in women students' self confidence and self esteem may be sexist and hostile behavior directed at women by faculty or male peers (Seymour & Hewitt, 1997).

While there is evidence that family background has a strong effect on the decision to attend college (Hossler, Schmit and Vesper, 1999; Mare, 1980) research on the effects of family background on the decision to enroll in graduate programs is mixed (Mare, 1980; Stolzenberg, 1994; Mullen, Goyette, & Soares, 2003). Most researchers agree that better educated parents usually translates into higher socioeconomic status (SES). Higher SES children attend better schools and have more educational resources than do children of lower SES (Stolzenberg, 1994). In addition, the educational background of parents may signal possibilities and family expectations to children. However, the influence of parental education on sons and daughters' graduate education choices in STEM disciplines is less clear. Mare (1980) and Stolzenberg's (1994) research found that parents educational achievement did not affect graduate enrollment. They argued that the higher students go in the educational system the further removed from their social roots they become. However, Mullen, Goyette and Soares (2003) found that, while mothers' education had no effect on graduate enrollment, fathers' educational achievement was significantly related to long term educational persistence.[1]

[1] While the results of this analysis were discussed in their paper, the authors did not provide specific data on the effect of father's compared to mother's education achievement on their daughters' and sons' postgraduate enrollment.

If the level of parental education was simply a marker for increased economic resources, one would expect to see the effect fade as students enter graduate or professional training, as some have argued (Stolzenberg, 1994; Mare, 1980). If, however, parental educational attainment is an indicator of parental expectations and role modeling, then the effect should continue into graduate school for both men and women. To test this, I predict:

> **H1:** Higher levels of parental educational attainment will increase the likelihood women and men will pursue post-DVM graduate training.

Existing research on parental influence on daughters' educational choices shows that women who enter male-dominated disciplines often come from families where both parents are highly educated, where the mother works outside the home, and where success is considered critical (Jackson, Gardner, & Sullivan, 1993). In part, this finding may be explained by research that shows that children whose parents have higher levels of education tend to resist gender stereotyping while children whose parents have lower levels of education tend to conform to gender stereotypes (Bouchard & St-Amant, 2000). There is, however, some evidence that this influence may be gender linked. For example, research examining sex differences in parental influence shows that fathers with science and engineering occupations appear to have a larger effect on the likelihood of sons entering these fields than of daughters entering these fields (Leslie, McClure, & Oaxaca, 1998), while mothers' education seems to have a greater positive effect on their daughters' educational achievement than on their sons', especially if the mother works in a STEM profession (Leslie, McClure, Oaxaca, 1998; Scandura &

Ragins, 1993; Sax 1996). Since, as members of a minority, women will encounter more barriers to studying advanced science than men, maternal role models who have earned advanced degrees should be more important to women than paternal role models with advanced degrees will be to men. I would, therefore, predict that:

> **H2:** Higher levels of maternal educational achievement will increase the likelihood that female students will pursue post-DVM graduate training **(H2a);** and the effects of higher levels of paternal educational achievement on the likelihood that male students will pursue post-DVM graduate training will not be as strong **(H2b)**.

In addition to socioeconomic resources, sociologists have paid increasing attention to the effects of social resources on individuals' life chances (Lin, 1999; Portes, 1998; Campbell, Marsden, & Hulbert, 1986) and to the influence of social ties on educational and career decisions and achievement (Seymour & Hewitt 1997; Ibarra & Smith-Lovin 1997; Portes, 1998; Podolny & Baron, 1997; Ibarra, 1993). This line of STEM inequality research examines how students develop an identity as a scientist and learn the social practices of the scientific community (Cunningham & Helms, 1998). There is good evidence that the disproportionate success of men in professions can be explained by the fact that they are more likely to acquire appropriate professional identities swiftly, with little inner conflict (Costello, 2005). This process of socialization is often the result of a student's interactions with more experienced individuals within the profession. Many studies report that, for students who persist in STEM education, mentoring relationships consistently appear to play a critical role (Baker & Leary, 1995; Hill, Pettus,

& Hedin, 1990) and that they are particularly important for women's success (Dipboye,1987; Ragins & McFarlin, 1990; Ragins & Cotton, 1999; Blake-Beard, 1999; Bazzari, 1995; Atwater, 1993). For example, Bahniuk, Dobos & Kogler Hill, (1990) found that men advanced more in their careers than women regardless of whether they had mentors, yet women without mentors advanced more slowly in their careers than women with mentors.

While the preponderance of evidence seems to indicate that mentoring increases undergraduate students' success in STEM, to date no studies have looked at how the occupational location of the mentor affects students' decisions to seek advanced training. For this study, the mentors were limited to veterinary college faculty and veterinarians in private practice, primarily because these types of mentors could offer students guidance and socialization into the profession in ways that parents, partners, or friends would be unlikely able to do. To explore how the mentor's occupational location influences students' career and educational decisions I propose the following Hypothesis:

> **H3:** Students with research faculty mentors will be more likely to aspire to advanced training than students who either do not have a mentor or who have a mentor of a different type **(H3a);** and students with veterinary practitioner mentors will be more likely to select private practice as a post-DVM career choice than will students who either do not have a mentor or who have a mentor of a different type **(H3b).**

In addition to the occupational location of the mentor, the sex composition of the mentoring dyad may also influence the degree and type of mentoring support a student receives (Ragins, 1997, 1999; Burke & McKeen,1990; Paludi, DeFour, Craithwaite, Chan, Garvey, Kramer, Lawrence, Haring-Hidore, 1991). Although early research on mentoring indicated that there were no sex differences in the type of mentoring men and women receive (Ragins & McFarlin, 1990), more recent studies have shown that support may vary based on the sex of the mentor rather than the sex of the protégé. Female mentors may provide more psychosocial support while male mentors provide more career support (Sosik & Godshalk, 2000). In addition, there is evidence suggesting that female mentors may be best for women's career advancement because they are better able to help women learn strategies for dealing with barriers such as work-life balance and skills in negotiating sexist behaviors and assumptions (Tharenou, 2005; O'Neill, 2002; Ragins, 1999; Noe, Greenberger & Wang, 2002).

In view of the fact that research findings on the sex composition of the mentoring dyad is ambiguous, as to what dyad composition is the most beneficial for students' long term educational persistence in STEM disciplines, it is important for that this research examines the effects of same-sex mentoring. Based on the results from the literature reviewed, which indicates that both men and women may gain more from same-sex mentoring I propose that:

> **H4:** Female students with female mentors will be more likely than female students with male mentors to pursue post-DVM graduate study **(H4a);** and male students with male mentors will be more likely to pursue advanced training than male students with female mentors **(H4b)**.

In addition to the organizational position of the mentor and dyad composition, it is important to explore how different qualities of the mentoring relationship influenced career choices. The mentoring research literature has explored two primary mentoring behaviors (Kram, 1985). The first is the instrumental or career development function of mentoring; this involves sponsorship, exposure and visibility, coaching, protection, and challenging assignments, and it tends to depend on a mentor's power and position in the organization or profession (Ragins & Cotton, 1999). Examples of this kind of mentoring include such things as letters of recommendation; assignments to visible roles within the college; and having the student accompany the mentor to a prestigious conference. The second type of mentoring, called psychosocial, includes role modeling, acceptance, counseling, and friendship and is dependent on interpersonal aspects of the mentoring relationship (Ragins & Cotton, 1999). Psychosocial mentoring may take the form of offering a sympathetic ear to the student or encouraging them when they encounter professional obstacles. Other researchers have shown that these functions proposed by Kram (1985) are distinct and measurable (Ragins & McFarlin, 1990; Scandura, 1992; Tepper, Shaffer, & Tepper, 1996).

A substantial amount of the literature on mentoring supports the concept that career development support is much more important than psychosocial support to women's persistence and advancement within educational disciplines and professions (Burke & McKeen, 1990; Ragins & Sunderstrom, 1989, 1999; Wallace, 2001). In fact psychosocial support has been shown to reduce women's advancement more than it reduces men's advancement, especially if the mentor is female (Tharenou, 2005). To explore whether career support or psychosocial support influences women and

men's educational and career choices differently I have formulated the following Hypothesis:

> **H5:** Career development will be a more important mentor function than psychosocial support in women students' decisions to seek advanced training.

Role modeling has also been identified as playing a key role in students' career decisions (Campos-Outcalt, Senf, Watkins, & Bastacky, 1995; Williams, Saizow, Ross, & Deci, 1997; Griffith, Georgesen, & Wilson, 2000). Research suggests that for women and minorities to be successful they need to have role models in their environment (Ely, 1994; Gilbert, 1985; Kanter, 1977). Gibson and Cordova (1999) also suggested that visible exemplars of women in authority may increase women's ambitions. Role modeling helps students to learn the social practices of the scientific community and to develop an identity as a scientist. For women in nontraditional disciplines like science role modeling may play an important part in the decision whether or not to attend graduate school. To test this I propose the following hypothesis.

> **H6:** Mentor role modeling will increase the likelihood that a female student will seek advanced training

The STEM Environment

While the science and engineering professions rank among the highest in occupational prestige in the United States, and the earning potential in these careers is considerable, advanced careers in science are highly competitive and require a lengthy and

expensive training period. In addition to these hurdles, female students, in particular, may face the added burden of several institutional barriers to success in these careers, including feelings of isolation due to the low number of women, especially senior women, in science and engineering (Fox, 1996; Vetter, 1996; Sonnert & Holton, 1995); the lack of sufficient and varied role models and mentors (Charles, 1992; Vetter, 1996; Valian, 1998, Lovitts, 2001); stereotyping (Association of American Colleges and Universities, 2000; Georgi, 2000; Valian, 1998; Dasgupta & Asgari 2004); an environment perceived as denigrating, devaluing, and marginalizing women's professional contributions (Hollenshead, Wenzel, Lazarus & Nair, 1996; Baldi, 1998; Biernat & Manis,1991; Wenneras & Wold, 1997); dual career issues and a lack of institutional support for family issues that continue to fall predominantly on women (Bailyn, Drago, & Kochan, 2001; Rosser, 2004; Mason & Goulden, 2004; Finkel & Olswang, 1996).

The more autonomous and highly paid fields of science, such as human medicine, veterinary medicine, and engineering have traditionally been male while the less prestigious, lower-paying, "supportive" roles such as registered nurse, veterinary technician, or research technician have traditionally been the realm of women. However, since 1970 women have been entering many of these male-dominated fields at increasing rates. Between 1960 and 1988, when women were making large inroads into the health professions, the number of women in dentistry grew from 2.1% to 7.7%. During that same period, the number of female physicians increased from 6.7% to 17.3% while among veterinarians, women's representation went from less than 1 in 50 (1.8%) to over 1 in 5, or 20.8% (Bird, 1992). Women now make up 70% of veterinary

students and 36% of practicing veterinarians (Brown & Silverman, 1999). By 2015, the American Veterinary Medical Association predicts that women will make up 78% of the professional student population and 67% of the practicing veterinarians (Brown, & Silverman, 1999). Yet, much like other professions, horizontal and vertical gender segregation persists (Curran, 1995; Daily, Certo, & Dalton 1999; Bickel, Wara, Atkinson, Cohen, Dunn, Hostler, Johnson, Rubenstein, Sheldon,& Stokes, 2002). Women comprise only 9% of the senior academic administrators; 14% of full professor positions; 30% of associate professor; and 45%of the assistant professor in academic veterinary medical science (Association of American Veterinary Medical Colleges, 2003). Hence, while women are a majority of veterinary students, they remain significantly underrepresented among senior veterinary faculty and administrators.

Of particular interest to this study is how organizational demographics, particularly sex composition, influence the educational and career choices of men and women in veterinary medicine. Research shows that the effects of occupational sex composition on educational decisions differ for men and women. Men are more likely than women to avoid disciplines where the proportion of females is increasing (England, Allison, Li, Mark, Thompson, Budig, & Sun, 2003). This difference in response may be explained by research that suggests that men find it stigmatizing to enter fields that they perceive as “too female” (Williams, 1993). If male students see large numbers of women among graduate students and faculty in a particular discipline they may conclude that it is a “female field” and avoid applying for advanced graduate study (England, Allison, Li, Mark, Thompson, Budig, & Sun, 2003). In addition, since there is ample evidence that salaries are lower in occupations with a higher proportion of women (England, 1992;

Bellas, 1994) men and women may use the proportion of women in a particular field or specialty as an indicator of their future earning potential in that field, and they may avoid fields they perceive as being feminized.

To test if the organizational context of veterinary medicine influences students' entry into advanced training, I use the number of female students and tenured female faculty at each school as an indicator of the degree of feminization within veterinary medicine at the school.

> **H7:** As the percentage of female students and female faculty increases the likelihood that students will seek advanced training decreases **(H7a);** and this effect will be stronger for men than for women **(H7b).**

Data and Methods

Data

Twenty of twenty-seven U.S. colleges of veterinary medicine participated in this project.[2] The participating colleges included public and private institutions in urban and rural settings, within seven of the eight geographic regions used in the Integrated Postsecondary Education Data System (IPEDS). Veterinary student enrollment in the participating colleges ranged from 208 to 538, with a median of 319. Based on prior research indicating that students identify role models and mentors who influence their career choices approximately 2.5 years into their educational or professional training

[2] Three schools with response rates lower than 10% (5 or fewer surveys returned) were dropped from the analysis

programs (Basco & Reigart, 2001), the student sample was limited to1,490 third year students.

The total number of usable surveys was 644, representing 43% of the original survey population.[3] The individual-level data was derived from an 82-item questionnaire that included measures of mentoring functions and satisfaction, past and present experiences with mentoring, individual characteristics, career plans and goals, and in the case of individuals with multiple mentors, separate assessments for each relationship.

The final sample was 77% female (496 women and 148 men). The average age was 27 (range was 23 to 56 years). Fourteen percent of the respondents reported being members of a racial or ethnic minority, with the following break down: white (89%), American Indian/Alaskan Native (2.5%), Indian Asian (1.1%), Hispanic/Latino(a) (3.7%), Central/Southeast Asian (2.3%), Black/African-American/African (4.3%). A comparison of these results with veterinary college enrollment data collected by the Association of American Veterinary Colleges (AAVMC) indicates that, demographically, this sample is not significantly different from the general veterinary student population (see table 3.1)

[3] Due to restrictions of the Family Educational Rights and Privacy Act (FERPA) a sampling frame of all third year veterinary students could not be constructed in order to produce a random sample for analysis. Instead, a contact person at each college of veterinary medicine agreed to distribute and collect the survey instrument. Each college's response rat was influenced by the contact person's method of distribution (e.g. distribution through student mailbox, which always yielded a lower number of completed surveys or in class distribution). Response rates ranged from 10% to 89%).

Table 3.1

Variable	Survey	AAVMC
Average age	**27**	**26.82**
Percent female	**77**	**73**
Percent Minority	**13.9**	**9.4**

Organizational level data was collected from various archival sources including college publications, web pages, professional journals, and professional organizations. In addition, the contact from the student survey, usually the Dean of Students, responded to a short, 16-item organizational questionnaire about theoretically important questions not available through archival research, such as each college's educational outcome goals and specific information about the college's mentoring practices.

Methods

Because the data consists of individuals nested within colleges, my primary method of analysis was multivariate hierarchical linear modeling (HLM). This choice of analysis is grounded in the perspective that students will vary not only as individuals, but also as a function of their educational context. HLM allows for differences among the colleges and among the students within the colleges to be incorporated into one model. See Bryk and Raudenbush (1992) for an explanation of this statistical method.

Estimating separate regression models for each level allowed me to specify how variables at one level affected relations at another level. Bernoulli models, which

estimate the odds ratio as a function of individual and college characteristics, were used for analysis of the binary dependent variables. All individual-level variables are grand mean centered, thus the intercept represents the adjusted average of the dependent variable after controlling for all covariates.

Dependent Variables

The dependent variables are two dichotomous variables representing student's future career plans: veterinary medical practice or advanced training past the Doctor of Veterinary Medicine (DVM) degree. The advanced training dependant variable includes students who indicated intentions to apply to a one-year internship program, a multi-year residency program, a masters program, a doctoral program, or some combination of these (Brown & Silverman, 1999). The variable was coded 1 if the student selected any one of these as a future career plan; 0 if the items were not selected.

Independent Variables

Each analysis described below was run separately for men and women in order to explore which characteristics contributed to men's and women's career decisions. Of principle interest is whether gender differences in individual characteristics and external forces influence women and men's career choices. Several independent variables described below were used to measure this (see Appendix 3-A for an inventory of all observed variables).

Mentor type: To test for the specific effects of a particular mentor, dummy variables for four types of mentor-student dyads were created: veterinary practitioner; and three

veterinary faculty categories based on the primary role of the mentor; clinician, teacher, or researcher. The variables were coded 1 if the student marked that particular type of mentor and 0 for students who did not have a mentor or did not have that specific type of mentor. Therefore the analysis compares students with a specific type of mentor to all other students.

Mentor function scales: A fifteen-item scale measured the extent to which a mentor demonstrated three particular mentor functions toward the protégé. These were career development, psychosocial support, and role modeling. Responses ranged from 1 (not at all) to 5 (a very large extent). I used the mean of the summed results to create a scale (see Appendix 3-B for items and alphas). A variable was created for each function by multiplying the score on the scale by a dummy variable that was coded 1=has a mentor; 0=does not have a mentor.

As control variables I used several individual level characteristics that are theoretically linked to career choice and educational outcomes and that similar research has employed. The following dichotomous variables are included: veterinary medicine was first career choice (1=yes), marital status (1=single), race (1=student of color), and having financial dependents including children, spouse, or other family members (1=has a dependent). I created variable for same-sex mentoring dyads by multiplying a dummy variable that was coded 1=has a mentor; 0=does not have a mentor, by a variable that was coded 1=same sex mentor. Thus same-sex mentoring relationships would be coded 1=same-sex and everyone else (un-mentored and those without a same-sex mentor would be coded 0).

The level of parents' education is measured using three dummy variables: high school diploma or less, college degree, advanced degree. High school diploma or less is the omitted category. The *Age* variable is a continuous variable and measures years.

Organizational Variables

I calculated college-level variables from 2004 Integrated Postsecondary Education Data Systems (IPEDS) and AAVMC data that measures all members of each college regardless of whether or not they were survey respondents. In order to examine how the organizational context influenced the likelihood a student would choose to seek advanced training I measured the following theoretically important aspects of each college: percentage of female faculty with tenure, percentage of female students, and the total size of the university.

Results

Sample Characteristics

Dependent variables: Table 3.2-A lists the means, standard deviations, and *p*-values for the dependent variables this study uses. The proportion of women who reported plans to seek advanced training post-DVM was greater than the proportion of men who reported plans to do the same (56% versus 44%). As one might expect, the proportion of both male and female students interested in advanced training grew smaller as the level of advanced training increased. However, except for a master's degree which women and men tended to pursue in equal proportions (8%), women were significantly more likely than men to want an internship (43% versus 30%), a residency (31% versus

21%), or a doctorate (6% versus 3%). In addition, compared to women slightly more men chose veterinary practice as a post-DVM plan (96% versus 82%).[4]

Independent variables - Table 3.2-B lists the means, standard deviations and *p*-values of the independent variables. The means for mothers and fathers' highest levels of education were very similar for both men and women. While women students had mothers who were slightly more educated than male students' mothers (15.23 years compared to 15 years), the level of education for male students' fathers was slightly higher than that for fathers of female students (15.95 years compared to 15.86 years). In addition, more of the sampled women than men are single (47% versus 45%), and a higher proportion of men than women reported they had dependents (16% compared to 6%). The average student's age was 27 years for both men and women, and many more women (80%) than men (75%) reported veterinary medicine as a first career choice.

Overall, fifty-eight percent of the students surveyed indicated that they had a mentor at the time they were surveyed. However, the male students were more likely than the female students to report a mentoring relationship (63% compared to 57%). An analysis of mentoring characteristics shows that more men than women reported having a mentor of their same sex (75% versus 40%) and that their mentor was primarily a teaching faculty member (25% versus 24%). In contrast, a higher proportion of women than men reported that their mentor was either a practitioner (42% versus 40%) or a

[4] Since the survey asked students to mark all options that described their post-DVM career plans, each category is not mutually exclusive.

member of their college's clinical faculty (21% versus 15%). The proportion of men and women whose mentor was a member of the research faculty was identical (13%). On average, women students reported higher levels of role modeling (3.9 versus 3.7), and psychosocial support (3.6 versus 3.4) from their mentors than did male students. In contrast, male students reported slightly higher levels of career development functions than did female students (3.9 versus 3.8). In addition, larger proportion of women than men reported having a female mentor (22% versus 12%).

Analysis of Hierarchical Linear Models

I performed HLM analyses separately for men and women. The complete student sample (n=629) provided a basis for comparing sex differences for (1) how individual characteristics influence women and men's career choices; (2) sex differences in the influence of external forces, such as parents and mentors; and (3) the effect of the educational institution's organizational context on individual career choices. For ease of interpretation, I used odds ratios to report the results. Odds ratios measure the odds of being in one category compared to another. An odds ratio of less than one indicates a decreased chance of an event occurring, while an odds ratio greater than one indicates an increase in the chance an event will occur. Odds equal to one indicate no effect.

<u>Hypotheses 1 and 2: Parents' Education and Post-DVM Career Intentions</u>

H1 predicted that higher levels of parental educational attainment would increase the likelihood women and men would pursue post-DVM graduate training. For H1 to be supported, mothers' and fathers' educations needed to significantly increase the odds that female and male students would pursue post-DVM training.

H1 was partially supported. Parents' advanced education (any degree beyond a bachelor's degree) positively predicted that a female student would seek advanced training but did not reach significance as a predictor for male students' choice of advanced training. The results show that female students whose parents have advanced degrees are significantly more likely to pursue post-DVM training than are male students whose parents have advanced training (Table 3.3, column 3). Interestingly, the effect of fathers with advanced degrees is much stronger for women than the effect of mothers with advanced education.

H2 proposed that higher levels of maternal educational achievement would increase the likelihood a female student would pursue post-DVM graduate training (H2a), more than higher levels of paternal educational attainment would increase the likelihood a male student would pursue post-DVM graduate training (H2b). For H2a to be supported, mothers' educations needed to significantly increase female students' odds of seeking advanced training post-DVM. For H2b to be supported, the effect of mothers' education on the odds female students would seek advanced training would need to be greater than the effect of fathers' education on the odds a male student would seek advanced training.

The results (Table 3.3, column 3) support both H2a and H2b. Mothers with advanced degrees increase the odds by 73% that their daughters will seek advanced training post-DVM, while the influence of fathers' educations on their sons' decisions to pursue advanced training did not reach significance. The results indicate that neither the

mothers' level of education nor the fathers' level of education significantly influences sons to seek post-DVM graduate training.

Hypothesis 3: Mentor Position and Post-DVM Career Intentions

H3 predicted that students with research faculty mentors would be more likely than students with other mentor types or without a mentor to aspire to advance training (H3a) and students with veterinary practitioner mentors would be more likely than students with other mentor types or without a mentor to select private practice as a post-DVM career choice (H3b). For H3 to be supported there would need to be a significant increase in the odds that students with mentors in research faculty positions would pursue advanced training post-DVM (H3a) and a significant increase in the odds that students with mentors who are veterinary practitioners would be more likely to select private practice as a post-DVM career choice.

H3a is partially supported. Women students with research mentors are over five times more likely to pursue post-DVM graduate training than students with other mentor types or without any mentor (Table 3.3 column 3). In addition, female students with research mentors were 68% less likely to choose veterinary practice as a post-DVM career choice. However, research mentors had no significant influence on men's choice of post-DVM graduate training (Table 3 column 4). While it is difficult to determine whether women who were interested in advanced degrees chose research mentors or whether the research mentors influenced their mentees' decisions to seek advanced training, we do know that of the women who intended to seek advanced training, 44% indicated that they made that decision during veterinary school. This result coupled with

the rather large increase in the odds ratio for advanced training for students with a research faculty mentor (Table 3 column 3) tends to indicate that the mentor had a positive effect on the decision process.

Hypothesis 3b was not supported. Although 25% of all students indicated that their mentor was a veterinary practitioner, this particular mentor type had no significant impact on either male of female students' choice to enter private veterinary practice as a post-DVM career (Table 3.3 column 1 and 2). Interestingly, the odds of women selecting veterinary private practice as a post-DVM career plan increased by 146% if their mentor was a faculty member whose organizational role was primarily clinical.

Overall, these results support past research that shows that mentoring has more of an impact on women's careers than it does on men's careers (Bahniuk, Dobos & Kogler Hill, 1990).

Hypothesis 4: Mentoring Dyad Composition

Hypothesis 4a proposed that female students with female mentors would be more likely than female students with male mentors to pursue post-DVM graduate study, and Hypothesis 4b proposed that male students with male mentors would be more likely to pursue advanced training than male students with female mentors. For H4a or H4b to be supported, the same-sex mentor variable needed to significantly increase the odds that a female or male student would seek advanced training.

H4 was not supported. The results from the analysis of the influence of a student having a mentor who is the same sex as the student indicated no significant difference in career influence from mentors who are the opposite sex of the student (Table 3.3, column 3 and 4). These results, coupled with the results of Hypothesis 3, may indicate that the mentor's sex may be less important than the mentor's organizational position.

Hypotheses 5 and 6: Mentor Career Support, Psychosocial Support, and Role modeling

Hypothesis 5 predicted that mentor career development would be more important than psychosocial support in female students' decisions to seek advanced training. For H5 to be supported, the odds ratio for career development for women who intended to seek advanced training needed to be significant and larger than the odds ratio for psychosocial support.

H5 was not supported. The results (Table 3.3, column 3) did not reach significance for either career development or psychosocial support. Interestingly, higher levels of career development tended to decrease the odds that either men or women would choose to enter private practice (women decreased by 51% while men decreased by 59%). This may indicate that mentors are encouraging students to work in specialty areas outside of traditional private veterinary practice.

H6 predicted that mentor role modeling would increase the likelihood that a female student would seek advanced training. For H6 to be supported, role modeling needed to increase significantly the odds that a woman would seek advanced training.

H6 was not supported. As shown in Table 3.3, column 3, while role modeling did increase the odds of choosing advanced training in the predicted direction it failed to achieve significance. However, role modeling did increase the odds that male students would choose veterinary medical practice by 304% for each one point increase on the role model scale.

Hypothesis 7: Organizational context and career choice

Hypothesis 7 predicted that, as the percentage of female students and female faculty increased the likelihood that students would seek advanced training would decrease. In order to support H7, the percentage female students and/or the percentage of tenured female faculty needed to significantly decrease the odds that all students would choose to pursue graduate training post-DVM. This would indicate that, as the discipline of veterinary medicine feminized, the likelihood that a student would choose to invest in further academic training in the field would decrease.

H7 was partially supported (Table 3.4, column 3 and 4). As the percentage of tenured female faculty increased, the odds of women pursuing advanced training decreased, by 9% for every 1% increase in tenured female faculty. Increasing numbers of female faculty did not appear to have a significant influence on male students' choice of post-DVM graduate training. In contrast, every one percent increase in the number of female students increased the likelihood that a female student would choose advanced training by 4%. The effect of increasing numbers of women students was non-significant for men.

Additional results indicate that the percentage of female faculty in schools significantly decreased the odds by 15% that men would choose private practice as a post-DVM career path.

Other Significant Results

Although racial and ethnic differences in career choice were not a focus of this paper it is interesting to note that race seems to be an important variable in the likelihood that a male student would seek advanced training post-DVM. The individual-level results indicate that the odds of nonwhite male students attending graduate school or some form of advanced training increases 280% as compared to white male students (Table 3.3, column 4). This trend toward training and careers outside of veterinary practice may be explained by the historically segregated nature of veterinary medicine (Journal of Blacks in Higher Education, 2004). In 2004, when this data was collected, minority students made up only 9.4% of the total veterinary medical student population and 13% of veterinary college faculty. Since there is evidence that minority women, particularly African American women, outpace white women in indicators of interest in and access to science programs further study of sex differences in the science career choices of minority women seems appropriate.

An additional individual-level result of interest is relationship status. The results in Table 3.3, columns 1 and 2 show that single women are about 45% less likely to choose veterinary practice, while the odds of single men choosing veterinary practice increase by 230%.

Discussion

This study contributes to the discussion of sex differences in the educational and career choices of students in STEM disciplines in four important ways. First, this research uses data from professional students with a proven record of success in science rather than undergraduates; second, it examines students in only one discipline instead of combining multiple disciplines in the expectation that all STEM fields are equal; third, it explores the importance of such external forces as parents and mentors on educational and career choices; and finally, this study examines the effects of organizational context, specifically the organizational demographics of the educational institution, on men's and women's career aspirations. The results of these analyses demonstrate that there are sex differences in how these factors influence the likelihood students will pursue advanced training or choose to enter the workforce.

Overall, parental support is more relevant to women's than to men's decisions to seek advanced training. While studies of graduate education have shown that the effects of family background on educational achievement diminish once the student has achieved a baccalaureate degree, the results of this study demonstrate a continuing influence for women but not for men. The analysis supports my argument that the effect of parental educational achievement on sons' and daughters' choice of whether to pursue advanced training is an indicator of parental expectations and role modeling, rather than simply an indicator of economic resources. In addition, the strong and positive effect of mothers' educations on their daughters seems to indicate that mothers serve an important role in encouraging daughters to enter and advance in nontraditional disciplines such as science. Interestingly fathers with advanced degrees seem to have

a slightly greater influence on their daughters' decisions to pursue advanced training than do mothers with advanced degrees.

In addition to parental influence the results indicate that mentors have a greater effect on women's than on men's educational and career decisions. Although the presence of a mentor did not affect students' educational and career decisions, certain types of mentors and the type of support they provided did. As predicted, mentors who were primarily research faculty played a large role in increasing the odds a woman would seek advanced training and decreased the likelihood that a student would enter veterinary practice. Although veterinary practitioners did not have a significant influence on either men's or women's career decisions, as was predicted, clinical faculty did. Having a primarily clinical faculty mentor, increased the odds that a female student would choose to enter private practice as a veterinary clinician. The results of this study suggest that the mentor's organizational role is an important factor to consider when examining how mentors influence career and educational outcomes for students.

In addition to examining how the mentor's organizational position influenced students educational and career decisions, I also examined the effects of the type of support mentors provided. Although the level of career development students receive from their mentors did not influence either men's or women's decision to seek advanced training, career support did negatively affect both men's and women's decisions to enter private practice. These results indicate that those mentors who are offering career support are encouraging their students to seek careers in veterinary medical specialties other than

private practice. Future research should investigate the qualitative aspects of career support in order to better understand the qualities of career support.

A surprising finding of this study was the degree to which mentors' role modeling increased the likelihood that male student will aspire to enter private practice. Although most scholars would agree that role modeling plays an important function in students' ability to learn the social practices of the scientific community and in developing an identity as a scientist, the research indicates that the role modeling function should be more important in a woman's than in a man's career decisions. The large increase in the odds of entering private practice for men with strong role models may indicate that, for men, a shared identity with a mentor may have a larger influence on career decisions than it does for women.

Contrary to the mentoring literature, which finds that same-sex role modeling is especially important for the success of women in nontraditional disciplines, this study found that same-sex mentoring dyads had no more influence on a student's career choice than cross-sex dyads had. However, since only 23% of women had same-sex mentors this result should be interpreted with caution.

The results of the analysis of the educational institutions' organizational contexts show a mixed outcome. They may indicate that the effect of the feminization of a discipline may be dependent upon which indicator of feminization is used for analysis. As predicted an increase in the number of tenured women faculty seems to decrease the likelihood that students will invest more resources in a graduate education, but only for female

students. The results for male students are non-significant. However, an increase in the number of female students in a discipline increases the likelihood that a female student will pursue advanced training by 4% for every one percent increase in female student enrollment. This result may be explained by the fact that not only are individual disciplines sex-typed, but, in professions employing both men and women, individual subspecialties become labeled as either male or female. Subspecialties which are predominantly male, and therefore still very attractive parts of the profession, most often require advanced training.

Conclusion

Overall, the results of this research indicate that parents, mentors, and the organizational context of a discipline all play significant roles in women's career and educational choices. The continuing positive influence of parents' educational achievement, as well as the influence of mentors, indicates that significant people in a female student's environment can play a role in her success in STEM. However, not all mentors or types of mentoring are equal. If colleges want to increase the number of women in advanced training programs they should focus on helping women connect with research mentors who can inspire them to pursue advanced training.

The limitations of this study include the small percentage of women with female role models. Future research may want to design a method of sampling that will increase the likelihood of including more female same-sex mentoring dyads. In addition, future research should explore the effects of race on students' educational decisions. Developing a better understanding of how race and gender interact in mentoring

relationships could increase the odds a student of color would be attracted to and retained in a STEM profession.

Future research should also explore the effects of career development. While the results of this study showed an increase in career development tended to decrease the odds a student would enter private practice, it failed to explain why this might be the case and how career development may positively effect career choice. Developing a better understanding of this mentoring function may help in our understanding of how mentors direct student career choices.

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CHAPTER THREE

TABLES

TABLE 3.2-A: Means and Standard Deviations for Dependent Variables

	Women Mean (N=483)	Men Mean (N=137)	Sample Mean (N=629)	*p*-Value
Advanced training Post-DVM	.566	.445	.528	.047
Veterinary Practice Post-DVM	.824	.945	.843	.207

TABLE 3.2-B: Means and Standard Deviations for Individual Level Independent Variables Total Sample (N=629)

	Women Mean (S.D.) (N=483)	Men Mean (S.D.) (N=146)	Sample Mean (S.D.) (N=629)	*p*-Value
Individual characteristics				
Veterinary Medicine was the first career choice (1=yes)	.797	.753	.778	.182
Age (years)	27.29 (3.88)	27.42 (3.54)	27.32 (3.80)	.964
Sex (1=female)	.770	.230	…	___
Dependents (1=yes)	.066	.164	.088	.003
Fathers highest educational level (years)	15.86 (2.79)	15.95 (3.13)	15.88 (2.26)	.602
Mothers highest educational level (years)	15.23 (2.46)	15.00 (2.43)	15.18 (1.84)	.379
Single	.470	.452	.46	.466
Person of Color	.118	.144	.123	.430
African American	.033	.082	.044	.044
Central/Southeast Asian	.027	.014	.024	.360
Latino(a)	.029	.062	.037	.128
Indian Asian	.010	.014	.011	.736
Native American	.019	.034	.022	.340
White	.896	.856	.887	.213
Scales				
Career development scale	3.78 (.747)	3.91 (.827)	3.81 (.766)	.809
Psychosocial scale	3.56 (1.04)	3.42 (1.03)	3.52 (1.04)	.041
Role modeling scale	3.87 (.713)	3.73 (.797)	3.84 (.734)	.026

TABLE 3.2-B cont.: Means and Standard Deviations for Individual Level Independent Variables Total Sample (N=629)

	Women Mean (S.D.) (N=483)	Men Mean (S.D.) (N=146)	Sample Mean (S.D.) (N=629)	*p*-Value
Mentoring History				
Currently in a mentoring relationship (1=yes)				
Mentor is same sex as student (1=same-sex)	.398	.750	.486	.000
Veterinary Practitioner is Current Mentor (1=yes)	.423	.402	.418	.659
Veterinary Medical Teaching Faculty is Current Mentor (1=yes)	.237	.250	.240	.484
Veterinary Medical Research Faculty is Current Mentor (1=yes)	.131	.130	.131	.761
Veterinary Medical Clinical Faculty is Current Mentor (1=yes)	.219	.152	.202	.353

TABLE 3.2-C: Means and Standard Deviations for College-Level Independent Variables (N=17)

	Mean	Standard Deviation
Size of university (number of students)	25,661.65	10,424
Percent female students	71.23	10.83
Percent tenured female faculty	13.38	3.60

TABLE 3.3: Base Model Logistic Regression Results for Student Career Intentions
(all results are presented as odds ratios)

	Base Model Results Private Practice		Base Model Results Advanced Education	
Individual-level Variables	Female	Male	Female	Male
Intercept	2.097***	1.596	1.413*	0.822
Individual Characteristics				
Age	1.012	1.000	0.946+	0.971
Dependents	0.591	0.642	0.920	0.271+
Single	0.558**	3.017*	1.112	0.841
Racial/Ethnic Minority	0.677	0.320+	1.818+	3.807*
First Career Choice is Veterinary Medicine	0.930	0.467	0.872	1.616
Mother–College	1.198	0.708	1.222	0.787
Mother–Advanced Degree	1.051	1.168	1.743*	1.897
Father–College	1.203	1.068	0.772	2.747+
Father–Advanced Degree	1.025	0.575	1.988**	1.696
Characteristics of Current Mentoring Relationship				
Career Development Functions	0.492***	0.411*	1.162	0.745
Psychosocial Functions	1.199	0.589	0.790+	1.635
Role model Functions	1.400+	4.044***	1.102	0.891
Same-Sex	1.248	1.651	1.459	0.781
Type of Mentor				
Veterinary Medical Practitioner	1.364	0.847	0.578	0.529
Veterinary Faculty				
Predominantly Teaching	0.723	0.683	0.723	3.546
Predominantly Research	0.323*	3.003	5.212**	0.528
Predominantly Clinical	2.467*	0.287	1.459	0.444
Random Effects				
Variance Component	0.042	0.431	0.185	0.537
X2	19.565	23.816	31.730	25.179
df	16.000	16.000	16.000	16.000
p Value	0.240	0.093	0.011	0.066
(N=)	439	120	435	112

+p<.10 * p<.05 **p<.01 *** p<.005

TABLE 3.4: Full Model Logistic Regression Results for Student Career Intentions
(all results are presented as odds ratios)

	Full Model Results Private Practice		Full Model Results Advanced Education	
Individual-level Variables	Female	Male	Female	Male
Intercept	6.848+	1.357	0.265	0.036
Individual Characteristics				
Age	1.013	0.970	0.941*	0.962
Dependents	0.609	0.712	0.907	0.232*
Single	0.557**	3.306**	1.107	0.807
Racial/Ethnic Minority	0.613	0.201*	1.784	5.638*
First Career Choice is Veterinary Medicine	0.927	0.448	0.855	1.607
Mother–College	1.186	0.739	1.243	0.774
Mother–Advanced Degree	1.021	1.211	1.775*	2.042
Father–College	1.220	0.899	0.821	2.883+
Father–Advanced Degree	1.029	0.541	2.113***	1.750
Characteristics of Current Mentoring Relationship				
Career Development Functions	0.489***	0.382*	1.124	0.795
Psychosocial Functions	1.207	0.594	0.793	1.736
Role model Functions	1.401+	4.288***	1.126	0.793
Same-Sex	1.213	1.568	1.452	0.725
Type of Mentor				
Veterinary Medical Practitioner	1.378	0.845	0.610	0.477
Veterinary College Faculty				
Predominantly Teaching	0.720	0.654+	0.754	3.202
Predominantly Research	0.331*	3.688	5.212**	0.615
Predominantly Clinical	2.555*	0.295*	1.556	0.373
College-level Variables				
Size of University	0.999+	1.000	1.000	1.000
Percent Female Students	0.985	1.024	1.040*	1.015
Percent Tenured Female Faculty	1.030	0.850*	0.909*	1.090
Random Effects				
Variance Component	0.000	0.058	0.058	0.383
X2	16.027	14.206	16.947	16.256
df	13	13	13	13
p Value	0.247	0.359	0.201	0.235
(N=)	436	117	432	109

+p<.10 * p<.05 **p<.01 *** p< .005

CHAPTER THREE

APPENDIX

Appendix 3-A - Inventory of Observed Variables

Name	Description
Dependent Variables	
Advanced Training	= 1 if student plan on seeking advanced training post DVM; 0 otherwise
Medical Practice	= 1 if students plans on an internship; 0 otherwise
Public Service	= 1 if students plans on a residency; 0 otherwise
Background Characteristics	
Age	= age at time of survey; 2004-year of birth
Single	= 1if respondent is single; 0 otherwise
Race	= 1 for student of color; 0 white student
Dependents	= 1if respondent has children or other financial dependents; 0 otherwise
Mother is a College Graduate	= 1 if mother has college diploma; 0 otherwise
Mother has a Graduate Degree	= 1 if mother has an advanced degree; 0 otherwise
Father is a College Graduate	= 1 if father has college diploma; 0 otherwise
Father has a Graduate Degree	= 1 if father has an advanced degree; 0 otherwise
Career Preference	= 1 if veterinary medicine was first career choice; 0 otherwise
Mentoring History	
Same-Sex	= 1 if respondent and mentor are the same sex, 0 otherwise
Veterinary Practitioner	= 1 if current mentor is veterinary professional, 0 otherwise
Teaching Faculty	= 1 if current mentor is teaching faculty in veterinary college, 0 otherwise
Research Faculty	= 1 if current mentor is research faculty in veterinary college, 0 otherwise
Clinical Faculty	= 1 if current mentor is clinical faculty in veterinary college, 0 otherwise
Qualities of Mentoring	
Mentor* Career Development Scale	Respondents with a mentor* Respondents score on scale
Mentor* Psychosocial Scale	Respondents with a mentor* Respondents score on scale
Mentor* Role model Scale	Respondents with a mentor* Respondents score on scale
Organizational Characteristics	
Size of University	The number of students at the university In 2004
Percent Female Students	Percent of veterinary students that are female in 2004
Percent Tenured Female Faculty	Percent of female faculty that are tenured in 2004

APPENDIX 3-B

Scales Used in the Study

Mentor Functions Scale

The three mentor function subscales were adapted from Scandura and Ragins (1993). The scale used a five point response format ranging from 1 (not at all) to 5 (a very large extent). The psychosocial sub-scale consisted of items (E, G, J, L, and O) α= .89. The career development sub-scale consisted of items (A, B, C, D, F, and N) α= .80. The role model sub-scale consisted of items (H, I, and M) α= .73. Item K was dropped from the role model subscale when it failed to load at an eigen value above .6.

A) My mentor takes a personal interest in my career.

B) My mentor has placed me in important assignments.

C) My mentor gives me special coaching.

D) My mentor advised me about career opportunities.

E) I share personal problems with my mentor.

F) My Mentor helps me coordinate professional goals.

G) I socialize with my mentor after school.

H) I try to model my behavior after my mentor.

I) I admire my mentor's ability to motivate others.

J) I exchange confidences with my mentor.

K) I respect my mentor's knowledge of the veterinary profession.

L) I consider my mentor to be a friend.

M) I respect mentor's ability to teach others.

N) My Mentor has devoted special time and consideration to my career.

O) I often go to lunch with mentor/MIP.

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2-Fullerton, H. (Ed.), (1998) Facets of mentoring in higher education. *SEDA* paper 103. Staff and educational development Association.

3-Ragins, B.R. (1997) Diversified mentoring relationships in organizations: A power perspective. *Academy of Management Review, 22*, 482-521.

4-Shellito,C., Weissmann, G., Mueller-Solger, A., & Davis, W (2001). Successful mentoring of undergraduate researchers. *Journal of College Science Teaching, 30*, 460-464

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APPENDIX A

STUDENT SURVEY

I am writing to ask your help in a study of veterinary medical students. The purpose of this study is to understand the factors influencing the career choices of students in science. This survey focuses specifically on the role of mentoring in students' academic lives.

Third-year veterinary students across the nation are being asked to respond to these questions about their experiences in veterinary medical training. Results from the survey will inform researchers and administrators who make programmatic decisions related to the recruitment and retention of students in advanced training programs.

Your answers are completely confidential and will be released only as summaries; no individual's answer can be identified. This survey is voluntary. However, you can help us very much by taking about 15 minutes to share your knowledge and information.

This study was reviewed and approved by the Washington State University Institutional Review Board. If you have questions or concerns regarding this study you may call the Institutional Review Board at 1-509-335-9661 referencing IRB 5681 or contact me directly at 1-509-335-7026, *byington@wsu.edu*, or you can write to me at the address listed below.

Tori C. Byington
Research Assistant
Graduate School
Washington State University
Pullman WA 99164-1030

Thank you very much for helping with this important study.

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START HERE

Career Goals

Q1. Was veterinary medicine your first career choice?

- ☐ No
- ☐ Yes

Q2. Think about your decision to attend veterinary school. How important were the following factors in your decision?

		Not Important ▼	Somewhat Important ▼	Very Important ▼	Essential ▼
A)	Enjoy working with people in the field	1	2	3	4
B)	Challenging work	1	2	3	4
C)	Working with animals	1	2	3	4
D)	Veterinary medicine pays well	1	2	3	4
E)	It satisfies the hopes of my parents	1	2	3	4
F)	Contributes to society	1	2	3	4
G)	Opportunities for rapid career advancement	1	2	3	4
H)	The practice of veterinary medicine offers me independence	1	2	3	4
I)	Relatives and friends are veterinarians	1	2	3	4
J)	Interest in biological science	1	2	3	4
K)	Veterinary medicine is a respected profession	1	2	3	4

Q3. Please mark all that describe your preferred post DVM career plan.

	No	Yes
Private Practice (partner)	☐	☐
Private Practice (employee)	☐	☐
Private Industry (e.g. pharmaceutical)	☐	☐
Military Veterinary Service	☐	☐
Research (non-educational setting)	☐	☐
Agricultural Extension	☐	☐
Zoo Animal Medicine	☐	☐
Laboratory Animal Medicine	☐	☐
Public Service (select one)	☐	☐

- ☐ Federal
- ☐ State

	No	Yes
Advanced training	☐	☐

(Mark all that apply and specify type, e.g. small animal internship, Pathology residency, MS in clinical sciences, Ph.D. in molecular biology.)

- ☐ Internship (please specify type) _____
- ☐ Residency (please specify type) _____
- ☐ Masters (please specify type) _____
- ☐ Doctoral (please specify)_____

Q4. At anytime during <u>undergraduate</u> or your <u>veterinary training</u> did you ever consider pursuing advanced training? (Such as a MS, Ph.D., internship or a residency.)

- ☐ Yes, I have considered advanced training beyond the DVM
- ☐ No, I have never considered advanced training beyond the DVM
- ☐ I currently have an advanced degree (please specify degree) _____

→ **Skip to 9**

Q5. When did you make your decision to seek advanced graduate training?

- ☐ a) Before entering college
- ☐ b) During my undergraduate training
- ☐ c) During vet school
  - □ First year
  - □ Second year
  - □ Third Year
- ☐ d) Although I have considered advanced training, I am still undecided

Q6. To date, who has been your single, most significant source of <u>encouragement</u> to seek advanced training?

- ☐ a) Mother
- ☐ b) Father
- ☐ c) Sibling
- ☐ d) Spouse/partner
- ☐ e) Pre-college teacher
- ☐ f) Someone who works in your chosen field
- ☐ g) College faculty member
- ☐ h) Graduate student or teaching assistant
- ☐ i) Someone else (please specify)_____

Q7. To date, who has been your single, most significant source of <u>discouragement</u> to seek advanced training?

- ☐ a) Mother
- ☐ b) Father
- ☐ c) Sibling
- ☐ d) Spouse/partner
- ☐ e) Pre-college teacher
- ☐ f) Someone who works in your chosen field
- ☐ g) College faculty member
- ☐ h) Graduate student or teaching assistant
- ☐ i) Someone else (please specify)_____

Q8. Are you currently in a dual program that could lead to a Masters or a Ph.D. while in vet school?

- ☐ No, I am not in a dual program
- ☐ Yes, I am in a dual program that will lead to masters degree
- ☐ Yes, I am in a dual program that will lead to a Ph.D.

Past Mentoring

In this survey, we are particularly interested in your experiences and views on mentoring and mentor-protégé relationships. We are defining a mentor-protégé relationship as one that goes beyond normal supervisory guidance. It is a relationship where someone invests time, know how and effort in increasing and improving your growth, knowledge, and skills.
<u>A mentor is someone with more experience in veterinary medicine whom you turn to for emotional support, career counseling, advice or support about educational or professional decisions.</u> A mentor may be a more advanced student, a graduate/teaching assistant, a faculty member, or someone who works in veterinary medicine outside of academia.

Q9. Prior to Veterinary College, were you ever in a mentor-protégé relationship?

- ☐ No → **Skip to 15**
- ☐ Yes

Q10. (If yes) What was your main position at the time? (If you had more than one mentor think of the individual you feel had the most influence on your career choices when you answer the following questions.)

- ☐ a) High school student
- ☐ b) Undergraduate student
- ☐ c) Graduate student
- ☐ d) Employee (academic setting)
- ☐ e) Employee (non-academic setting)
- ☐ f) Other (please specify)_____

Q11. What was the main position of your mentor?

- ☐ a) Pre-college teacher
- ☐ b) College faculty member
- ☐ c) Veterinary college faculty member
- ☐ d) Graduate student or teaching assistant
- ☐ e) Employer (academic setting)
- ☐ f) Employer (non-academic setting)
- ☐ g) Other (please specify)_____

Q12. What was the sex of your mentor?

- ☐ Female
- ☐ Male

Q13. How satisfied were you with this mentoring relationship?

- ☐ Completely dissatisfied
- ☐ Mostly dissatisfied
- ☐ Somewhat dissatisfied
- ☐ Neither satisfied nor dissatisfied
- ☐ Somewhat satisfied
- ☐ Mostly satisfied
- ☐ Completely satisfied

Q14. Did this past mentor encourage you to seek an advanced degree?

- ☐ No
- ☐ Yes

Current Mentoring

Q15. Currently is there someone whom you regard as a mentor—someone whose advice and counsel you especially value? (If you had more than one mentor think of the individual you feel had the most influence on your educational and career choices when you answer the following questions.)

- ☐ Yes → **Skip to 17**
- ☐ No

Q16. If you are not currently in a mentoring relationship, would you want to become involved in a mentor-protégé relationship if the opportunity existed?

- ☐ No
- ☐ Yes

→ **Skip to 23**

Q17. Select which relationship best describes the mentor who is currently most important to you.

- ☐ a) Mother
- ☐ b) Father
- ☐ c) Sibling
- ☐ d) Spouse/partner
- ☐ e) Pre-college teacher
- ☐ f) Someone who works in your chosen field
- ☐ g) College faculty member
- ☐ h) Veterinary college faculty member (select all that apply)
  - ○ Teaching faculty ○ Research faculty ○ Clinician
- ☐ i) Graduate student or teaching assistant
- ☐ j) other (please specify)

Q18. How long have you known this mentor? _____(yr/mo)

Q19. What is the sex of this mentor?

- ☐ Male
- ☐ Female

Q20. The mentor who is currently most important to you is?

- ☐ Your race/ethnicity
- ☐ Not your race/ethnicity

Q21. Who initiated this mentoring relationship?

- ☐ My college placed me with mentor
- ☐ My mentor initiated the relationship
- ☐ I initiated the relationship

→ **Q22. If you initiated this relationship, describe below how you found your mentor.**

Q23. Think about the last time you sought help from another person for the following. Please respond by filling in the blank with the person's relationship to you (e.g., a fellow student, spouse, faculty advisor, parent)

a) Advice on career matters?

_____

b) Academic guidance?

_____

c) Personal problems?

_____

d) Emotional support?

_____

Now, think of the person currently in your life who has the most influence on your educational or professional decisions.

Q24. The most influential person in my life is:

☐ a) Mother
☐ b) Father
☐ c) Sibling
☐ d) Spouse/Partner
☐ e) Another relative
☐ f) Pre-college teacher
☐ g) College faculty member
☐ h) Veterinary college faculty member
☐ i) Graduate student or teaching assistant
☐ j) Employer (academic setting)
☐ k) Employer (non-academic setting)
☐ l) Mentor
☐ m) A peer

Q25. Mark the description below that best describes your relationship with this person.

		No	Yes
a.	Peer pal—someone at the same level as yourself with whom you share information, strategy, and mutual support for mutual benefit	☐	☐
b.	Guide—can explain the system but is usually not in a position to champion a protégé	☐	☐
c.	Sponsor—less powerful than a patron in promoting the career of the protégé	☐	☐
d.	Patron—an influential person who uses his/her power to help you advance in your career	☐	☐

Q26. The person who is most influential is?

- ☐ Your race/ethnicity
- ☐ Not your race/ethnicity

Q27. The person who is most influential is?

- ☐ Male
- ☐ Female

Q28. I have known this person for_____(yr/mo)

Q29. The following questions address your perceptions about your relationship with your <u>current</u> mentor or the person you listed as the most influential person (MIP) in your life that you described above. Please indicate to what extent you agree or disagree with the following statements.

	Strongly Disagree ▼	**Somewhat Disagree** ▼	**Somewhat Agree** ▼	**Strongly Agree** ▼
A) The mentor/MIP that is currently most important to me is respected for their professional competence.	1	2	3	4
B) My current mentor/MIP is a good role model for students like me.	1	2	3	4
C) My mentor/MIP is someone I am satisfied with.	1	2	3	4
D) My current mentor/MIP is personable and easy to work with	1	2	3	4
E) My mentor/MIP is particularly helpful to students of my gender.	1	2	3	4
F) My mentor/MIP has been effective in his/her role.	1	2	3	4
G) My mentor/MIP fails to meet my needs.	1	2	3	4
H) My mentor/MIP disappoints me.	1	2	3	4
I) The relationship with my mentor has grown to be special.	1	2	3	4
J) I like my mentor.	1	2	3	4

Q30. Please indicate to what extent your mentor or the most influential person in your life has provided the following.

	Not At All	Slight Extent	To Some Extent	A Large Extent	A Very Large Extent
	▼	▼	▼	▼	▼
A) My Mentor/MIP takes a personal interest in my career	1	2	3	4	5
B) My Mentor/MIP has placed me in important assignments	1	2	3	4	5
C) My Mentor/MIP gives me special coaching	1	2	3	4	5
D) My Mentor/MIP advised me about career opportunities	1	2	3	4	5
E) I share personal problems with my mentor	1	2	3	4	5
F) My Mentor/MIP helps me coordinate professional goals	1	2	3	4	5
G) I socialize with my mentor/MIP after school	1	2	3	4	5
H) I try to model my behavior after my mentor/MIP	1	2	3	4	5
I) I admire my mentor's/MIP's ability to motivate others.	1	2	3	4	5
J) I exchange confidences with my mentor/MIP.	1	2	3	4	5
K) I respect my mentor's/MIP's knowledge of the veterinary profession.	1	2	3	4	5
L) I consider my mentor/MIP to be a friend.	1	2	3	4	5
M) I respect mentor's/MIP's ability to teach others.	1	2	3	4	5
N) My Mentor/MIP has devoted special time and consideration to my career.	1	2	3	4	5
O) I often go to lunch with mentor/MIP.	1	2	3	4	5

The following questions address perceptions about mentoring type relationships. To what extent do you agree or disagree with the following statements. (If you earlier marked that you do not have a current mentor, respond to the questions below while thinking about the most influential person you described above.)

		Strongly Disagree ▼	Somewhat Disagree ▼	Somewhat Agree ▼	Strongly Agree ▼
Q31.	If I do well, my mentor/MIP always lets me know.	1	2	3	4
Q32.	My mentor/MIP offers me information about the role and work of a veterinarian.	1	2	3	4
Q33.	I feel my mentor/MIP takes an interest in my future.	1	2	3	4
Q34.	My mentor/MIP never tells me that I have potential.	1	2	3	4
Q35.	My mentor/MIP introduces me to his or her colleagues and other professionals that may be helpful to my career.	1	2	3	4
Q36.	My mentor/MIP works with me to find solutions to problems I may face.	1	2	3	4
Q37.	My mentor/MIP doubts my abilities.	1	2	3	4
Q38.	My mentor/MIP encourages me to take additional courses outside of the curriculum that I may find challenging.	1	2	3	4
Q39.	My mentor/MIP gives me advice on my career and future career choices.	1	2	3	4
Q40.	My mentor/MIP encourages me to find solutions to my own problems.	1	2	3	4
Q41.	My mentor/MIP thinks my career goals are unrealistic.	1	2	3	4
Q42.	My mentor/MIP offers a listening ear when I need it.	1	2	3	4
Q43.	My mentor/MIP does not advise me on career decisions.	1	2	3	4
Q44.	My mentor/MIP offers constructive critical feedback.	1	2	3	4
Q45.	My mentor/MIP has little time to listen to my concerns.	1	2	3	4

		Strongly Disagree ▼	Somewhat Disagree ▼	Somewhat Agree ▼	Strongly Agree ▼
Q46.	My mentor/MIP is very approachable	1	2	3	4
Q47.	My mentor/MIP stays current with my progress.	1	2	3	4
Q48.	My mentor/MIP treats me like a colleague.	1	2	3	4
Q49.	I feel my mentor/MIP knows me as an individual.	1	2	3	4
Q50.	My mentor/MIP encourages me to do presentations or publish papers.	1	2	3	4
Q51.	I see my mentor/MIP as a resource.	1	2	3	4
Q52.	My mentor/MIP is committed to mentoring and feels it is important.	1	2	3	4
Q53.	I feel my mentor/MIP respects me.	1	2	3	4
Q54.	I feel I can trust my mentor/MIP.	1	2	3	4
Q55.	I feel I can be honest with my mentor/MIP.	1	2	3	4
Q56.	I respect and admire my mentor/MIP.	1	2	3	4
Q57.	My mentor/MIP conveys empathy for any concerns and feelings I discuss with him/her.	1	2	3	4
Q58.	My mentor/MIP gives me individual encouragement.	1	2	3	4
Q59.	I know my mentor/MIP will keep our discussions confidential.	1	2	3	4
Q60.	I get advice on how to balance my responsibilities and achieve professional goals.	1	2	3	4
Q61.	My mentor/MIP offers me guidance in how to “behave” in professional settings.	1	2	3	4

Q62. On average how often do you meet with your mentor?

- ☐ a) More than once a week
- ☐ b) Once a week
- ☐ c) Every two weeks
- ☐ d) Once a month
- ☐ e) Every few months
- ☐ f) Once a semester
- ☐ g) Once a year
- ☐ h) I have never met with my mentor

Current College Mentoring Programs

We are interested in the mentoring at your veterinary college.

Q63. Does your veterinary college have a formal mentoring program?

- ☐ No → **Skip to 67**
- ☐ Yes

Q64. The following questions address perceptions about mentoring in your current position as a veterinary student. To what extent do you agree or disagree with the following statements.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
	▼	▼	▼	▼
A) The formal mentoring program at my school is effective	1	2	3	4
B) The formal mentoring program allows me access to mentors who otherwise would not have been attainable.	1	2	3	4
C) I am satisfied with our formal mentoring program	1	2	3	4
D) The formal mentoring program made it easier for me to get a mentor.	1	2	3	4
E) I would be unable to get a mentor if not for the formal mentoring program.	1	2	3	4
F) The formal mentoring program is a waste of time	1	2	3	4
G) Participation in the mentoring program is voluntary	1	2	3	4

Q65. We are interested in how mentors and protégés are matched. Please check the one answer that best describes the matching process.

- ☐ a) Mentors and protégés are assigned to one another.
- ☐ b) The mentor chooses the protégé.
- ☐ c) The protégé chooses the mentor
- ☐ d) It is a mutual decision.
- ☐ e) Don't know
- ☐ f) Other (please describe) _____

Q66. What is the primary purpose of the mentoring program?

- ☐ a) Provide general orientation to the profession
- ☐ b) Encourage students into advanced training
- ☐ c) Provide support for the student
- ☐ d) Don't know
- ☐ e) Other (please describe) _____

Demographic Information

We would like to ask you some questions about yourself now.

Q67. In what year did you graduate from high school?_____

Q68. In what year did you begin vet school? _____

Q69. In what year were you born? _____

Q70. What is your sex?

- ☐ Female
- ☐ Male

Q71. How do you describe your relationship status?

- ☐ Single
- ☐ Married
- ☐ Partnered but unmarried

Q72. How do you describe your ethnicity? (check all that apply)

- ☐ a) Black/African-American/African
- ☐ b) Central/Southeast Asian (e.g., Chinese, Taiwanese, Vietnamese, Korean, etc)
- ☐ c) Hispanic/Latino(a)
- ☐ d) Indian Asian (e.g., Indian, Pakistani)
- ☐ e) Native American, American Indian, Alaskan Native, or First Nation
- ☐ f) White
- ☐ g) Other (please specify)_____

Q73. What is your mothers' occupation? _____

Q74. What was the highest educational level of your mother?

- ☐ a) Attended elementary school but did not finish jr./sr. high school
- ☐ b) Attended high school
- ☐ c) High school diploma of equivalent
- ☐ d) Some College or technical school, associates degree
- ☐ e) Finished 4 year college or equivalent
- ☐ f) Some graduate school but did not earn degree
- ☐ g) Masters degree (e.g. MA, MS, MAT, MPS)
- ☐ h) Professional degree (e.g., JD, MBA)
- ☐ i) Medical degree (e.g., DVM, MD, DDS)
- ☐ j) Doctoral degree (Ph.D., Ed.D, DA)
- ☐ k) Other graduate degree
- ☐ l) Not sure of highest educational level

Q75. What is your father's occupation? _____

Q76. What was the highest educational level of your father?

- ☐ a) Attended elementary school but did not finish jr./sr. high school
- ☐ b) Attended high school
- ☐ c) High school diploma of equivalent
- ☐ d) Some College or technical school, associates degree
- ☐ e) Finished 4 year college or equivalent
- ☐ f) Some graduate school but did not earn degree
- ☐ g) Masters degree (e.g. MA, MS, MAT, MPS)
- ☐ h) Professional degree (e.g., JD, MBA)
- ☐ i) Medical degree (e.g., DVM, MD, DDS)
- ☐ j) Doctoral degree (Ph.D., Ed.D, DA)
- ☐ k) Other graduate degree
- ☐ l) Not sure of highest educational level

Q77. Do you have children or others who are dependent on you financially?

- ☐ No
- ☐ Yes

→ How many_____

Q78. Do you have children who are currently living with you?

- ☐ No
- ☐ Yes

→ How many_____

Q79. What best describes your under-graduate institution? (mark all the apply)

- ☐ a) Private
- ☐ b) Public
- ☐ c) Single-sex
- ☐ d) Coed
- ☐ e) Urban
- ☐ f) Suburban
- ☐ g) Rural

Q80. What would you consider to be largest barrier or obstacle you have had to face during your veterinary training?

Q81. What has been or is the greatest support during your veterinary training?

Q82. Where do you see yourself career wise 5 years from now?

Thank you for completing this portion of the survey.

PLEASE CONTINUE TO NEXT PAGE

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Contact Information

A key component of this study is to track veterinary students as they advance in their careers. We would like to invite you to participate in future surveys, similar to this one. Although a comparison will be made between the answers you provide in this survey and any future survey, your answers will be completely confidential. Results will only be released as summaries in a way that no individual's answers to either survey can be identified.

We expect that, as a veterinary student close to degree completion, you will be moving to a new location and we will need a way to contact you. Please provide us with information on a permanent address (parents, sibling, other) that we would be able to contact in order to get your current address.

Your name and permanent address

Name and address of contact

Phone number and email of contact

Phone: _____
Email: _____

Please provide us with your email address if it is a non-university address that you intend to keep after your finish veterinary school,

Email: _____

PLEASE DETACH THIS SHEET AND RETURN IT WITH THE COMPLETED SURVEY TO BE PLACED IN A SEPARATE ENVELOPE

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APPENDIX B

COLLEGE ADMINISTRATOR SURVEY

This is the second phase of a study on educational persistence that your college participated in earlier this year. Participating in this part of the study involves completing a brief questionnaire. If at any point you need to consult with other faculty or administrators, please feel free to do so.

As part of our longitudinal study, we are interested in specific organizational characteristics that can only be answered by people familiar with your college. Participation in this survey is voluntary and your answers are completely confidential. However, you can help us very much by taking about 10 minutes to share your knowledge and information. If for some reason you prefer not to respond, please let us know by replying to this email.

Educational Outcomes

1. **Describe, in you own words, what a successful student outcome is at your Veterinary College.**

2. **Based on your college's mission and philosophy, numerically rank, in order of importance, the top three education outcomes.**

   ___ A high level of intellectual and technical expertise

   ___ Competence as a general practitioner

   ___ Leadership

   ___ Ethics

   ___ Attitude for service

   ___ Critical thinking

   ___ Effective communication

   ___ Personal and professional growth

   ___ Management skills

3. **In any given year, approximately how many students seek advanced training? (Such as a MS, Ph.D., internship or a residency.)**

Mentoring Program

4. **How important do you think it is for students to have a mentor? (Please explain why you feel this way.)**

5. **Does your college have a formal mentoring program?**

___ No

___ Yes →**(Skip to question 7)**

6. **If no, do you feel a formal mentoring program would be useful**

___ No

___ Yes

→ **(Skip to question 12)**

7. **Briefly describe the formal mission of your mentoring program? (Please feel free to cut and paste your formal mission statement.)**

8. **Which description best describes how your college's mentoring program is designed?**

___ Our students are primarily responsible for developing a relationship with a mentor.
(Skip to question 13)

___ Our college matches **all** students with a mentor.

___ Other (please describe) _____

9. **If your college is actively involved in matching students with mentors when does this usually take place? Please check the one answer that best describes your college's matching process.**

___ After the student is accepted but before he or she begins classes

___ Within the first year

___ Within the second year

___ Within the third year

___ Within the forth year

___ Other (please describe) _____

10. We are interested in how mentors and protégés are matched. Please check the <u>one</u> answer that best describes your college's matching process.

___ Mentors and protégés are assigned to one another.

___ The mentor chooses the protégé.

___ The protégé chooses the mentor

___ It is a mutual decision.

___ Don't know

___ Other (please describe) _____

11. To the best of your knowledge, how long has your college been active in the mentoring of veterinary students? (yr/mo)

12. What is the primary emphasis of your college's mentoring program? Please check the <u>one</u> answer that best describes this emphasis.

___ Provide general orientation to the profession

___ Encourage students into advanced training

___ Provide support for the student

___ Don't know

___ Other (please describe) _____

13. Does your college offer training for faculty and staff who mentor students?

___ Yes

___ No → **(Skip to question 15)**

14. If yes, is the training mandatory prior to working with students?

15. Does your college offer or coordinate a peer-mentoring program?

___ No

___ Yes

16. If yes, briefly describe its purpose and how students are matched with each other.

THANK YOU

APPENDIX C

HUMAN SUBJECTS REVIEW BOARD APPROVAL

WASHINGTON STATE UNIVERSITY

Office of Grant and Research Development

MEMORANDUM

TO: Tori Byington
Graduate School, WSU Pullman (1030)

FROM: Jamie Murphy **(for)** Cindy Corbett, Chair, WSU Institutional Review Board (3140)

DATE: 5 September 2003

SUBJECT: Approved Human Subjects Protocol

Your Human Subjects Review Summary Form and additional information provided for the proposal titled *"Mentoring and Educational Persitence A Longitudinal Examination of Mentoring, Gender, and Organizational Context,"* IRB File Number **5681**-a was reviewed for the protection of the subjects participating in the study. Based on the information received from you, the WSU-IRB **approved** your human subjects protocol on **5 September 2003**.

IRB approval indicates that the study protocol as presented in the Human Subjects Form by the investigator, is designed to adequately protect the subjects participating in the study. This approval does not relieve the investigator from the responsibility of providing continuing attention to ethical considerations involved in the utilization of human subjects participating in the study.

This approval expires on 3 September 2004. If any significant changes are made to the study protocol you must notify the IRB before implementation. Request for modification forms are available online at http://www.ogrd.wsu.edu/Forms.asp.

In accordance with federal regulations, this approval letter and a copy of the approved protocol must be kept with any copies of signed consent forms by the principal investigator for THREE years after completion of the project.

This institution has a Human Subjects Assurance Number FWA00002946 which is on file with the Office for Human Research Protections. WSU's Assurance of Compliance with the Department of Health and Human Services Regulations Regarding the Use of Human Subjects can by reviewed on OGRD's homepage (http://www.ogrd.wsu.edu/) under "Electronic Forms," OGRD Memorandum #6.

If you have questions, please contact the Institutional Review Board at OGRD (509) 335-9661. Any revised materials can be mailed to OGRD (Campus Zip 3140), faxed to (509) 335-1676, or in some cases by electronic mail, to *ogrd@mail.wsu.edu*.

Review Type: NEW
Review Category: XMT
Date Received: 26 August 2003

OGRD No.: NF
Agency: NA

PO Box 643140, Pullman, WA 99164-3140
509-335-9661 • Fax: 509-335-1676 • ogrd@wsu.edu • www.ogrd.wsu.edu