A CAMPUS CLIMATE SURVEY AT TEXAS A&M UNIVERSITY

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INTRODUCTION

In the Fall of 1994 the Women in Engineering, Science, and Technology (WEST) Program at Texas A&M University, in conjunction with Women's Studies, College of Business, and the History Department, received an award from the National Science Foundation (NSF) for the Model Projects for Girls and Women. There were several components proposed. A campus climate survey was one component which will be addressed in this paper. The survey was administered to 677 engineering students and 252 business students at Texas A&M University in January and February 1995. The purpose was to: 1) gain insight into the beliefs, attitudes, and experiences of students about women in a male dominated field; 2) give insight into the "climate" in the engineering classroom; and 3) examine the equity of student treatment in engineering. Questions were consciously written in an attempt to tap into important constructs affecting men and women in the classroom and career. Issues such as self-identity, self-confidence, self-esteem, motivation, mentoring/support, ability, family/career balance, competitiveness, classroom behavior, and general stereotyping, were explored through the survey.

METHOD

Participants

The target sample for this study was engineering and business students. We surveyed both men and women to determine if there was a difference in attitudes, experiences and beliefs. Engineering and business students because a large portion of students leaving engineering enter the College of Business and because both represent mainstream conservative attitudes on campus. Women are 19.6% of the College of Engineering population. They are 50% of the College of Business. The SAT scores and high school rank, of these two groups of students are also very similar at Texas A&M.

The researchers targeted 500 seniors and 500 freshmen or 1000 engineering/business students to participate in the study. There are only two common engineering courses for freshmen. So, ENGR 109 was targeted. This course has 50 students in each section, so the researchers contacted faculty and requested 20 minutes of class time to administer the survey. Seniors in engineering take no common courses, except the departmental senior design courses. So, senior design courses in chemical, petroleum, aerospace, electrical, and computer science agreed to give the researchers 20 minutes of class time. The College of

Business has a common course that all freshmen and another common course for all seniors take so, the researchers administered the survey to those common sections. The respondents completed a six page survey during a regularly scheduled class period. For the purposes of this paper, only the engineering sample will be discussed (n=677). Eighty-seven percent of the respondents reported they were between 18 and 23 years of age, the "normal" age of undergraduates. The College of Engineering at Texas A&M is 80.4% male (6159) and 19.6% female (1507). Therefore, for this survey, females were negligibly over sampled and males were negligibly under sampled.

Materials

The survey instrument was designed by a statistician/attorney who specializes in sexual harassment law and who has experience in survey construction. She is an Associate Professor in the Department of Management in the College of Business at Texas A&M and also a co-PI on the National Science Foundation grant that funded this survey.

The survey was divided into three sections. Section One covered demographic information, which included: gender, age, race/ethnicity, religious affiliation, birthplace, hours completed at Texas A&M, college, major, and GPR. Section Two covered classroom issues and was made up of multiple choice and open ended questions. Section Three covered attitudes, beliefs and experiences about women and men in engineering and business careers. There were 40 questions scored on a 5 point Likert scale. Respondents were requested to answer the questionnaire directly on the survey instrument. The survey required between 15-20 minutes to complete. The dependent variables were the attitudes, beliefs, and experiences of students in the engineering.

RESULTS

Discussion of Section Two

In Section Two of the survey, the question was asked, "Why did you choose your major field." The respondents were instructed to "Mark all that apply". Table 1 below summarizes responses by male (n=537) and female (n=139), raw score, and percentage.

Summary of responses to the Question, "Why did you choose your major field?" - **Table 1**

Reason	# Female	% Female	# Male	% Male
personal enjoyment or interest in field	104	75.82	449	83.61
good pay	99	71.22	384	71.51
availability of jobs	89	64.03	323	60.15
prestige of major or field	66	47.48	200	37.24

encouraged by high school teacher or counselor	29	20.86	55	10.24
my talent in major or field	49	35.25	215	40.04
encouraged by college professor or advisor	11	7.91	26	4.84

This data indicates that "personal enjoyment or interest in the field" is the most often chosen with "good pay" and "availability of jobs" being the next two reasons for selecting engineering as a major for both men and women. The data also indicates that twice as many women as men report that a high school "teacher or counselor encouraged" them into the field. "Prestige" was ranked fourth by women with men ranking their "talent in the field" as fourth (40.04% for men and 35.35% for women). Twice as many women report they chose their field because they were "encouraged by a college professor or advisor." Clearly high school teachers and counselors continue to be important to women selecting engineering as a career.

Another question in Section Two was, "Which of the following do you perceive to be barriers to women pursuing a career in your major field?" The respondents were instructed to "Mark all that apply". Table 2 below summarizes responses by male (n=537) and female (n=139), raw score, and percentage.

Summary of responses to the Question, "Which of the following do you perceive to be barriers to women pursuing a career in your major field?" - **Table 2**

Response	**# Female**	**% Female**	**# Male**	**% Male**
lack of contact with women professors in the field	66	47.48	158	29.42
discriminatory attitudes on the part of professors in the field	52	37.41	57	10.61
demands of field that would pose conflict between career and family	67	48.20	160	29.80
view that women in the field are unfeminine	38	27.34	148	27.56
lack of encouragement from friends or family	16	11.51	121	22.53
competitive atmosphere of field	48	34.53	131	24.39
lack of confidence about being able to complete the work	63	45.32	144	26.82
discriminatory attitudes on the part of professionals in the field	75	53.96	169	31.47

This data indicates the top three perceived barriers to women in engineering, by both males and females, are: 1) discriminatory attitudes on the part of professionals in the field; 2) demands of the field that would pose conflict between career and family; and 3) lack of contact with women professors in the field. While women perceive the same barriers as men, almost twice the percentage of women report the barriers as men. Women perceive "lack of confidence about being able to complete the work" as the fourth barrier with men reporting "view that women in the field are unfeminine," as the fourth perceived barrier. Women perceived "discriminatory attitudes on the part of professors in the field" at almost three times the rate as men. Men perceive almost double the barrier for women on "lack of encouragement from friends or family." Women perceive more barriers around lower pay for women, the competitive atmosphere of the field, and limited opportunities for advancement in the field. This data indicates that women perceive a substantially higher percentage of barriers for women in engineering than do men for women in engineering.

Discussion of Section Three

T tests were run on Section Three of the survey to determine if there was significant difference between men and women in their attitudes, beliefs, and experiences about women and men in engineering and business. The Likert Scale was 1=Strongly Disagree to 5=Strongly agree. A discussion of some of the statistical differences follows. Questions pertaining to only business are omitted (#3, 6, 10, 14, 16, 18, 19) for the purposes of this paper.

There was a significant difference at the .05 level between male and female students on two thirds of the questions using the Likert scale (1-5). Female students agreed more strongly than male students on questions such as: "I think women students are more likely to doubt their ability than male students" (t=5.76, P=.000); "Professors call on male students more often than on female students" (t=3.91, P=.000); and "Female students are more often interrupted by male students in engineering or science classes" (t=3.90, P=.000); "Professors should be more aware of gender issues in the classroom" (t=4.94, P=.000); "Professors tend to encourage men more than women to ask questions in class" (t=2.22, P=.027). This set of questions indicates that experiences in the classroom are not the same for male and female students. There is still room to improve on which group of students is encouraged to answer questions and who can speak without interruption. These differences add to women's beliefs that they don't belong and/or are not valued in engineering.

The male students agree more strongly than the female students with statements such as: "Women who pursue scientific careers are probably less committed than men who pursue those careers" (t=-3.69, P=.000); "Women who major in engineering or science are, on average, less feminine than women who major in business" (t=-5.71, P=.000); "Men have a natural ability to do better than women in math or science courses" (t=-5.24, P=.000); "Most women don't have the leadership ability to succeed in fields such as business or engineering" (t=-7.64, P=.000); "Women in engineering or science probably have a more

negative outlook on life than women in the arts or humanities" (t=-4.44, P=.000); "Women who pursue careers in science or engineering probably like to compete with men" (t=-2.65, P=.008); "Men are more motivated to succeed in their careers than are women" (t=-3.34, P=.001); and "Women who want to succeed in business or engineering should learn to be more like men" (t=-2.75, P=.006). This group of questions clearly demonstrates that male and female engineering students hold some strong cultural stereotypes such as: 1) men are naturally better at math and science; 2) women are not as committed to their careers as men; 3) women who want to succeed in engineering and/or science must act like men; 4) women in engineering like to compete with men; and 5) women aren't as good leaders as men.

ANOVAS BY RACIAL GROUPS

ANOVAs were run on the third section of the survey to determine if there was significant difference between ethnic groups in their attitudes, beliefs, and experiences about women and men in engineering and business. This data includes all participants, both engineering and business (n=930). There were 33 questions asked and 7 found no significant difference between racial groups but five of the same questions showed significant difference between males and females on the t-tests. These questions vary in topic: 1) "Learning is primarily the student's responsibility;" 2) "I prefer to study with students of the same sex;" 3) "I think that women define themselves by the type of career they have to the same extent that men do;" 4) "Classroom diversity gets in the way of effective learning;" 5) "Men probably have less natural ability for non-mathematical or non-scientific fields than do women;" 6) "The professor is primarily responsible for whether students in his or her class learn;" and 7) "Women who major in science or engineering probably have more self-confidence than men majoring in those fields." The last 2 questions are the ones that showed no significance between males and females on the t-tests. Of the 27 questions that did show significant difference by racial groups, 24 showed significant difference between Asians and Anglos; 9 questions showed significant differences between Anglos and Hispanics; 6 questions showed significant difference between Anglos and African Americans; 10 questions showed significant difference between Asians and African Americans; and only one question showed significant difference between Hispanics and African Americans.

The questions most interesting in the ANOVAS were questions that showed strong gender stereotypes in the t-tests: 1) "Men have a natural ability to do better than women in math or science courses;" 2) "Women who pursue scientific careers are probably less committed than men who pursue those careers;" 3) "A woman who can be 'one of the guys' is more likely to succeed in business or engineering;" 4) "Women who pursue careers in science or engineering probably like to compete with men;" and 5) "Most women don't have the leadership ability to succeed in fields such as business or engineering." In all these questions, Asians agreed the most strongly followed by Anglos with African Americans being the group in least agreement. Or if said another way, African Americans, who participated in this survey, hold less gender stereotypes than the other racial groups. Asians demonstrated the most significant gender stereotyping.

Hispanics agreed most strongly with the statement, "Diversity is important to classroom learning." Asians believed this strongly followed by African Americans and then Anglos. This is not surprising since the survey was on a predominately white campus. There are many interesting differences by race.

CONCLUSION

This survey shows a significant statistical difference between men and women's attitudes, beliefs, and experiences in engineering. It also shows significant statistical difference between racial groups about attitudes, beliefs, and experiences in engineering. The survey concurs with surveys at Carnegie Mellon University (Palmgren, 1993), Arizona State University (Cosgrove, 1994), and Iowa State University (Evans, 1993) that women don't have as much confidence in their ability to do engineering; that a financially rewarding career is a primary reason for women to study engineering; that interest in the field is a significant factor in choice of career; and that women are influenced more in career choice by teachers and counselors than men. Barriers to women in engineering were also confirmed such as balancing career and family; lack of female role models; a competitive atmosphere; and discriminatory attitudes toward women in engineering. This study cannot be taken as an identifier to all the barriers that exist for women in non-traditional fields. But, in confirmation with other studies, there begins to be statistical proof which supports the anecdotal information that has existed for many years at Texas A&M and other colleges of engineering in the nation.

After this survey was conducted, several programs were put in place to address these differences. Former students, female engineers who graduate from Texas A&M, were invited to return to campus for a Women in Engineering Conference. The greatest benefits are role models for the engineering students and the discussions around balancing career and personal life. A corporate mentor program was also initiated. Both the Women in Engineering Conference and the mentor program give students opportunities to learn from engineers the realities of an engineering career and coping strategies.

The change in engineering pedagogy initiated in the NSF Foundation Coalition, addresses many of the classroom inequities found in the survey. As the College, womens and minority programs work together, we believe many of the differences reported in the survey will be addressed and eventually changed.

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