

## CROSS-CULTURAL & CHILLY CLIMATE ISSUES IN ENGINEERING

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### Positive Opportunities for Women Engineers' Retention New Jersey Institute of Technology Newark, New Jersey 07102

In the spring semester of 1995, 624 faculty surveys were collected for a National Science Foundation grant called P.O.W.E.R. (Positive Opportunities for Women Engineers' Retention) at these five New Jersey colleges: the New Jersey Institute of Technology (NJIT) and four community colleges which historically transfer students to NJIT's College of Engineering. Hudson County College in Jersey City and NJIT in Newark are urban campuses in the New York metropolitan area, while the other three county colleges (Middlesex, Ocean, and Brookdale) are suburban campuses located in central New Jersey. The P.O.W.E.R. study primarily focused on faculty/student attitudes toward women in engineering, science and technology. However, the Humanities and Social Sciences were also surveyed to test conventional stereotypes about how "liberal" the liberal arts really are compared to engineering and science. Additionally, race, ethnicity, and nationality were studied in relation to faculty attitudes toward women, as well as campus hate speech. This paper will discuss faculty results only.

### Method

The P.O.W.E.R. questionnaire was designed (Fall 1994) by reviewing other university faculty surveys in order to build on previous research, then culled down to the three most relevant surveys to fit a state engineering institute: a) Dr. Sue Rosser's survey questions on classroom climate targeted at the University of South Carolina science faculty; b) Ball State University's questions on faculty collegiality; and c) Northwestern University's campus climate questions on racism and sexism. We conducted 28 faculty interviews at all 5 New Jersey colleges (Fall 1994) and held 3 faculty focus groups (an all male group; an all female group; and a mixed gender group of faculty) at Middlesex County College, to hone faculty survey questions. The faculty survey was pretested at Brookdale Community College (January 1995), then administered to the entire full-time and some part-time faculty in the Engineering/Science/Math/Humanities/Social Sciences at the other four colleges (January-March 1995) at their first faculty meeting of the Spring semester.<sup>1</sup> The faculty surveyed are broken down by college in this way:<sup>2</sup>

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<sup>1</sup> The POWER survey was administered by the POWER PI and POWER Faculty mentors: at Middlesex by Engineering Technology/Physics Professor Josephine Lamela and Math Professor Lucy Gullo; at Hudson County College by the Coordinator of Engineering Science, Professor Mojdeh Tbatbatbaie; and at Ocean County College by Math Professor Judy Lenk. At NJIT it was administered at Engineering Departmental meetings in February and March 1995 by the POWER PI, Dr. Roxanne Hiltz, and Dr. Judy Valyo with the help of Engineering Department chairs. The survey was administered by Associate Dean Anne Wiley to the College of Science and Liberal Arts at NJIT by campus mail. Thanks to the following POWER NJIT graduate students who worked long and hard coding this data: Oksana Manzhura and Ed Hudak; as well



**NJIT 166 (27%); Brookdale 161 (26%); Middlesex 161 (26%); Ocean 76 (12%); Hudson 50 (8%); Women Engineering Professors from other universities 10 (1%).**

## Results

This paper summarizes faculty perceptions of the campus climate and classroom focusing on three variables: a) Gender differences and b) Nationality differences among N.J.I.T. faculty ; and c) Differences between disciplines/divisions: social science, humanities, math/science, and engineering/technology at all five colleges in the aggregate.

### campus climate

The following campus climate trends were reported by faculty at all 5 colleges surveyed:

#### **Increased Urbanity= Less Hate Speech against U.S. Minorities ( Women, Blacks, Jews & Gays)**

Less hate speech (warmer climate) is reported on urban campuses while more hate speech (chillier climate) is reported on suburban campuses by faculty in New Jersey. The majority (about 2/3) of suburban college faculty report occasionally hearing sexist language, sexist and racist jokes whereas the majority (about 3/5) of urban college faculty report never hearing racist or sexist speech by faculty/staff/ administrators. Consistently throughout the study, more faculty at suburban schools report chilly climate incidents of all degrees, ranging from hate speech to violent action, than faculty at urban campuses. In fact, the farther south geographically one goes away from New York into New Jersey, the percentage of faculty reporting hate speech against American women, racial minorities, Jews, and gays increases. (TABLE 1.)

#### **Urbanity & Nationality**

#### **Suburban College Faculty Report More Students Make "Derogatory Remarks About Someone's Nationality" Than Faculty ; Whereas Urban College Faculty Report The Reverse.**

Urban faculty in New Jersey hear more derogatory remarks about one's nationality made by faculty than students. This trend may be explained by a larger international population of both professors and students at the urban schools in the New York metropolitan area than in

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as the undergraduates: Nikki Robinson, Frances Ermi, Tali Morgan; and the POWER secretary, Sharon Williams.

<sup>2</sup> **NJIT Faculty Sample:** The N.J.I.T. Faculty sample consists of 166 male and female professors, from the Newark College of Engineering and College of Science & Liberal Arts (CSLA). Most of the faculty sample were full-timers in Engineering or Math/Science, but for comparative purposes, a small number of social science and humanities faculty and part-timers at N.J.I.T. were also surveyed. N.J.I.T. only had 6 full time women engineering professors during the Spring of 1995 when the survey was administered.

**Women Engineering Professors from Other Universities:** Because 85% of the entire 166 N.J.I.T. faculty respondents sampled were male, and the female engineering professor n at N.J.I.T. was so small, the POWER PI made public announcements asking full time women engineering professors from other universities attending the Summer 1995 WEPAN National Conference and the Fall 1995 WEPAN Northeast Regional Conference at Stevens Institute of Technology to fill out POWER questionnaires to give the POWER study a larger female engineering professor n. Ten women engineering professors obliged and returned completed POWER questionnaires by mail from the following universities: 1 from Yale University, 3 from University of Maryland, 4 from Virginia Tech, and 2 from the University of Central Florida. The ten women engineering professors from four other universities have been added to the N.J.I.T. female professor group. All of the male professors in the sample teach at N.J.I.T.; so do the majority of the women in the sample. Henceforward, we refer to "male N.J.I.T. professors" and women professors.



the suburbs. Nationality appears to be more an issue at the urban colleges among faculty than the suburban colleges--though it is not irrelevant there either.

**Faculty/Staff/Administrators Are Just As Likely As Students To Be Overheard Telling Sexist And Racist Jokes And Using Sexist Language At All Colleges Studied.** Faculty report little difference among faculty/staff/administrators & students regarding overhearing racist and sexist jokes. However, at all five schools, sexist language and sexist jokes are heard by more faculty than racist jokes. Racist and sexist jokes are pervasive in New Jersey colleges surveyed in 1995. Sexist language and jokes are reported by the majority (2/3) of all suburban college faculty and by about 2/5 of urban college faculty and thus constitute part of core college sub-culture in New Jersey. Sexist language and jokes rank Number One; racist jokes rank second in frequency at the 5 New Jersey colleges surveyed.

**Faculty Witness Students Threatening & Using More Violence Than Faculty:**

At all colleges surveyed, more faculty report occasionally witnessing students threaten violence and use physical violence than they see among faculty/ staff/ administrators. The occasional incidence of faculty observed student physical violence varies by college campus: ranging from 11% to 33% of faculty, depending on the college. There is no clear pattern of student violence based on the urban-suburban continuum, which defies conventional stereotyping about the violence of inner city life.

**Homophobia - 2** New Jersey trends: Homophobic remarks are more common among students than faculty; but are far more common among both professors and students in New Jersey suburbs than in the cities of Newark and Jersey City. More students are overheard making Anti-Gay remarks than Faculty at all colleges studied. This may be co-related to age. Faculty/staff/administrators occasionally make anti-gay remarks overheard by nearly half the faculty at suburban colleges compared to less than one third of urban faculty.

**Gender & Hate Speech**

**Gender makes little difference in Faculty Reports of Sexist Speech on Campus.** That is, men were equally as likely as women to report overhearing sexist language or sexist jokes on campus. Gender made little difference in faculty reports of all forms of chilly climate issues except in two areas: racist jokes and stalking.

**Gender Affects Faculty Reports of Racist Jokes**

**RACIST JOKES:** The majority of male faculty at all 5 Colleges surveyed report hearing racist jokes on their campus while the majority of female faculty (55%) have not heard racist jokes. Interpretation: This may mean that men tell each other racist jokes more than women do to each other. Perhaps more importantly, it appears that men do not tell racist jokes in the presence of women faculty as often as they do in the presence of male faculty on these 5 New Jersey campuses.

**Gender Affects Faculty Reports of Stalking Incidents**

**STALKING:** No male faculty report knowledge of any stalking incident where the perpetrator is faculty/staff/ administrator. Only female faculty do. All reports of stalking by faculty/staff/administrators thus come from female faculty. However, male faculty are aware of student stalking incidents.

## **How Gender Affects NJIT Faculty Perceptions of the Classroom**

Looking at the engineering/science classroom, some interesting gender differences emerge among N.J.I.T. Faculty around the various topics of sex ratios, women graduate students and male students. The majority of N.J.I.T. male professors answer differently from the majority of female professors regarding these variables:

### **1. female graduate students have a difficult time.**

The majority of N.J.I.T. male professors surveyed (52%) disagree, while the majority of female professors (52%) agree that "I think that female graduate students have a more difficult time than male graduate students."

### **2. student sex ratios affect classroom dynamics.**

An overwhelming majority (70%) of women professors agree while 40% of N.J.I.T. male professors (the mode) disagree that "The ratio of male to female students affects classroom dynamics."

### **3. whether female graduate students have a difficult time.**

The majority of N.J.I.T. male professors (52%) disagree while the majority of women professors (52%) agree that female graduate students have a more difficult time.

### **4. whether male students talk more in class.**

The majority of N.J.I.T. male professors (56%) disagree, while the majority of female professors (58%) agree that "Male students are more active in responding to questions than females."

### **5. whether sex discrimination charges are unfounded.**

Sixty three percent of women disagree that "Charges of sex discrimination are frequently unfounded," while 61% of N.J.I.T. male professors say they have no opinion on this subject.

### **6. men comfortable with women bosses.**

The majority (76%) of women professors disagree that "Most men would be comfortable working for a woman boss" while the mode (46%) of N.J.I.T. male professors say they have no opinion on this subject.

### **7. socializing with colleagues advances career.**

The mode (44%) of women professors agree that "Social interactions with my colleagues have been important to my career advancement" while the mode of male professors (39%) disagree. We also found that more minority professors believe that socializing with colleagues helps career advancement than white professors do. This suggests that white men either do not see or believe that "the old boy network" operates as much as women and minorities.

## **Where Male & Female Professors Agree On Faculty-Student Relations**

The gender of a professor made little or no difference in their answers to most survey questions. Engineering and science professors surveyed in New Jersey generally agree on far more faculty-student issues than they disagree. The majority of both female and male professors agree on the following classroom issues:

### **1. most professors comfortable with graduate students.**

The majority of N.J.I.T. male professors (72%) disagree that "I am uncomfortable when meeting graduate students of the opposite sex because of the possibility of charges of sexual harassment." So do an overwhelming 94% of women professors.

### **2. women students don't contradict professors.**

The majority of men (60%) and the majority of women (75%) professors disagree that "Female students in my classes contradict me."

However, when we ask whether male students contradict N.J.I.T. professors, we find an interesting phenomenon. The percentage of male professors holds steady around 3/5; the majority of

male professors (59%) say that male students do not contradict them. Yet the percentage of women professors drops almost 30 percentage points between the two questions: from 75% of women professors who said women students do not contradict them to 48% who said men students do not contradict them. Also, one quarter (26%) of women professors say their male students do contradict them in class. While gender makes little difference regarding faculty perception of women students challenging professors in the classroom, gender may affect faculty perceptions of male students.

### **3. male students do not challenge most professors' classroom authority.**

While the majority of both N.J.I.T. male (79%) and women professors (56%) disagree that "Male students regularly challenge my authority in the classroom," many more males feel this way than women. Also, a quarter of women professors (28%) say male students *do* challenge their authority in class. This phenomenon needs more research.

### **4. professor's classroom questions.**

Ninety one percent of women and 81% of men agree with the statement: "I ask male students the same types of questions I ask of females." Thus faculty of either gender do not feel that they treat women students differently from men.

### **5. women rarely appear in my textbooks.**

The majority of women professors (55%) and the mode of men (46%) agree that "Women rarely appear in the textbooks I use." Over a quarter of men (27%) disagree, however.

### **6. most faculty support university childcare.**

Sixty six percent of men and 85% of women agree that "The university should provide quality, low-cost child care for both faculty and students." While the majority of both sexes favor university supported childcare, many more women do than men.

## **How Nationality Affects NJIT Faculty Perceptions of Faculty-Student Relations**

Only NJIT data on nationality is presented here. The ratio of American to international professors at NJIT is more evenly divided than at the other colleges surveyed: 97 American and 73 international faculty respondents at NJIT.

Demographically, about 3/4 (72%) of the NJIT faculty respondents are white. However, only 52% of them are born in the USA; 16% are European, 20% born in Asia, and 6% in the Middle East. No African-American professors completed a questionnaire at NJIT. Less than a handful of Black Caribbeans (2%) and Hispanic (1%) professors did. The vast majority of people of color are Asian (21%), predominantly Indian and Chinese, and 4% Middle Eastern (e.g., Iranian, Turkish, Egyptian). The rest did not state their nationality. Faculty responses to these questions differ by nationality:

### **1. whether student sex ratios affect classroom dynamics.**

Notably higher percentages of American faculty (48%) agree that sex ratios affect classroom dynamics compared to (33%) of international faculty.

### **2. whether women in their field need to "fit in" with men.**

More Americans (48%) than internationals (26%) disagree that "women students won't have any problems in my field as long as they blend in with the men."

### **3. whether the curriculum is gender-biased.**

The majority of all nationalities at NJIT disagree that the curriculum is gender biased, but many more internationals (79%) than Americans (58%) disagree.

### **4. whether families suffer when mothers work full-time.**

More internationals (42%) agree that children will suffer in families where the mother works full-time than Americans (20%). In fact, 56% of Americans disagree that children suffer when mothers work full time.

### **5. whether they sacrifice family needs to job needs.**

Far more internationals (46%) than Americans (29%) state that they often sacrifice the needs of their family to the needs of their career. In fact, about 2/5 of Americans say they do not sacrifice their families to the job.

### **6. whether social interactions with colleagues affect career advancement.**

More internationals (41%) than Americans (23%) agree that social interactions have been important to their career advancement. In fact, 47% of Americans disagree. This question also provoked a similar response from women and racial minorities who believe that socializing with colleagues is valuable to career advancement, while white men generally do not.

### **7. whether men would be uncomfortable working for women bosses.**

Most Americans (52%) disagree that "most men would be comfortable working for a woman boss" while 58% of internationals say they have no opinion. These responses could mean that more Americans are willing to talk about the discomfort of having a female superior, while internationals would rather avoid the issue. Or does it mean that more internationals would feel more comfortable working for a female boss? More research is needed to answer these questions.

## **How Departmental Division Affects Faculty Perceptions of Faculty-Student Relations at 5 N.J. Colleges**

When respondents are broken down by division (engineering/ technology, science/math, social science, and humanities) at all five colleges, their responses differ in the following ways:

### **1. Whether gender affects pedagogy.**

Notably higher percentages of engineering/tech (51%) and science/math (44%) faculty disagree that "the gender of the professor makes a difference in how a subject is taught" than social science (23%) and humanities (34%) faculty .

### **2. impact of male/female ratio on classroom dynamics.**

Many more engineering/tech (46%) faculty disagree that sex ratios affect classroom dynamic than faculty in any other division. However, 43% of the science/math faculty agree, along with 52% of social science, and 55% of humanities faculty agree that sex ratios affect classroom dynamics. Interestingly enough, faculty in the "soft sciences" where sex ratios are generally nearer equal believe that sex ratios make the most difference. Faculty in the "hard sciences" where there are higher male-lower female sex ratios, see sex ratios as less important to classroom dynamics.

### **3. whether women rarely appear in textbooks.**

The majority of engineering/tech faculty respondents (55%) agree that "women rarely appear in the textbooks I use," while 40% in science/math, 42% in social science, and 60% in humanities disagree. Clearly women appear much less in engineering/tech textbooks than in textbooks in any other division .

### **4. importance of considering racial bias in textbooks.**

The majority of engineering/tech faculty *disagree* (52%) that "I consider possible racial bias in a text as one of the factors in selecting a text," while the majority of social science (51%) and humanities (55%) *agree*. Science/math faculty were more split between 34% disagreeing and 25% agreeing .

### **5. do departments try to hire female faculty?**

More than any other division, the majority of engineering/tech faculty (56%) agree that their department makes a concerted effort to increase the number of women faculty, but that there



are not enough qualified applicants. Only 23% of science/math faculty agree. On the other hand, 39% of both social science and humanities faculty disagree that their departments make a good faith effort to hire women.

#### **6. Whether they sacrifice family needs to job needs.**

Most professors in the science/math (50%), social science (53%), and humanities (53%) divisions disagree that they often sacrifice family needs for career," whereas only one-third of engineering-tech respondents disagree. This may be because there is a higher number of women in the non-engineering disciplines.

## **Discussion**

### **Departmental Division**

The majority of engineering/technology respondents do not see racial bias as an important factor in text selection. This could be interpreted two ways: either they believe there is no racial bias in their textbooks or they may not feel it important to eliminate racial bias from their texts. Humanities and social science respondents clearly believe that there may be some racial bias in their texts, and that it is important for them to take this into account. This divisional difference is striking.

Engineering/Technology faculty say they are more likely to sacrifice family needs to the demands of their jobs. But is that because they are predominantly males in the engineering division? Specifically, is this more a phenomenon of gender than of departmental division?

In summary, departmental division makes a notable difference in faculty responses to certain gender and race related questions. More than any other discipline, Engineering/Technology faculty are more likely to dismiss questions about whether gender affects classroom dynamics, the hiring of female faculty, and whether their textbooks are racially-biased.

### **Nationality**

In sum, international faculty differ from American faculty regarding: the impact of sex ratios on classroom dynamics, the need for professional women to "fit in" with men, the existence of gender bias in their curricula, the impact of working mothers on families, the acceptability of sacrificing family needs to job needs, the importance of social interaction with colleagues to career advancement, and the issue of male discomfort with female superiors. It appears that American faculty at NJIT place greater importance on gender issues. More internationals believe that mothers who work full-time will harm their children. Internationals seem more reluctant to discuss their feelings about working for a female superior on this questionnaire.

### **Gender**

Sex ratios are an interesting variable throughout this study. We found that sex ratio questions, more than any other, polarized people by gender, race, nationality, and ethnicity. Male professors do not think the high male: low female student sex ratios of engineering classrooms matter much. Women professors do. More research is needed on the effect of sex ratios on classroom dynamics.

The P.O.W.E.R. data also suggests that male professors do not notice the often cited observation in the women's literature on classroom climate (Sandler, 1982; Rosser, 1990) that male students talk more in class.

This suggests the possibility that there may be certain behaviors/subjects where one is gender blind: e.g., men may not notice that other men are doing all or most of the talking. However, they may notice when women are doing all the talking. Perhaps male professors, blinded by their gender, really cannot see that other men, in this case students, are dominating classroom talk. Black studies literature has long pointed out that members of dominant groups, i.e., whites, are often unaware that they dominate discussions when minority group members are present (Rothenberg, 1988). Minority groups are painfully aware of the dominant group; the reverse is not true.

These findings, along with the fascinating differentials on how male and female professors view male student's challenge to their classroom authority, suggest that the engineering/science classroom is still indeed a gendered space. We conclude with a Campus Gender Climate Table:

**Table 1. Campus Gender Climate**  
Reported by Faculty at 5 N.J.Colleges (n=614)

Faculty Overheard/Saw Faculty/Staff/Adm. Engage in:	Urban		Suburban		
	NJIT	HCC	BCC	MCC	OCC
Sexist Jokes	45%	43%	61%	65%	63%
Sexist Language	42%	42%	62%	65%	62%
Racist Jokes	42%	27%	51%	53%	59%
Gender Discrimination	28%	30%	37%	34%	45%
Sexual Harassment	25%	26%	27%	28%	44%
Rape	1%	4%	5%	2%	4%
Anti-Semitic Remarks	22%	22%	35%	33%	40%
Anti-Gay Remarks	30%	32%	46%	47%	53%