



A Cross-Institutional Comparison of Elements of College Culture That Promote Women's Interest in Engineering at the Undergraduate Level [1]

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Introduction and Objectives

Leaders of change efforts involving climate issues in colleges and universities have experienced the persuasive potential of combining current, locally generated data with benchmarking data from peer institutions. Sharing a cross-institutional comparison of elements of the in- and out-of-class environment that promote and sustain an interest in engineering is a key element of the strategy used by our team to generate dialogue within and among institutions to achieve broader impacts.

Data for this project were collected through on-line questionnaires distributed to all faculty and undergraduate students in engineering, by document analysis, and by individual and group interviews conducted with faculty and students in two departments during campus visits to nine colleges and universities. This poster shows key comparisons among the first four participating colleges and universities and provides information about two deliverables shared with participating institutions.

Participating Institutions

Participating institutions were selected to compare the cultures of colleges or schools with above average and below average graduation rates of undergraduate women in engineering. Thirty percent or better of the undergraduate engineering graduates are women in the institutions with a plus sign (+), while women are between 14% and 17% of the graduating class of the other institutions. The figure below provides a name of the institutions participating in each of the three rounds.

Round 1 (2005-6) (complete)	Round 2 (2006-7) (complete)	Round 3 (2007-2008)
MIT (Pilot) ⊕	Tufts ⊕	University of Kentucky
Boston University ⊕	Dartmouth ⊕	Cal State, Pomona (tentative)
	Brigham Young	Oregon State (tentative)
		Rochester Institute of Technology

⊕ Designates institutions with above average graduation rates of women.

Interest in Engineering

The dependent variable in this study, interest in engineering, is measured in two ways: the percentage of respondents in engineering who agree that if they had to do it again, they would major in engineering, and, secondly the percentage who indicated that they "probably" or "definitely" would be likely to be working in engineering-related field ten years from now.

Across all institutions, women were less likely than men to express an interest in remaining in engineering. The most pronounced gender differences were in the expectation of pursuing an engineering career. Figures 1 and 2 provide a cross-institutional comparison of the data on the dependent variables. A surprising number of engineering undergraduates do not expect to be working in an engineering-field in ten years (from a low of 12% to a high of 40%).

Figure 1: Women are Less Likely than Men to Agree that If They had to Do it Again, They Would Still Major in Engineering*

Percent of Respondents that Agree that If They had to Do it Again, They Would Still Major in Engineering, by Gender and Institution			
High and Low Enrolling Institutions		Males % (N)	Females % (N)
Above Average	1	86.6 (82)	86.6 (67)
	2	86.3 (22)	73.7 (20)
	3	81.3 (134)	88.2 (93)
Below Average	4	92.5 (265)	88.5 (70)

* Responses are merged for somewhat and strongly agree. Green color shows high; red low.

Figure 2: Women are Less Likely than Men to Agree that it is Likely They Will be Working in Engineering Ten Years from Now

Percent of Respondents that Say that They Will Probably or Definitely be Working in Engineering-Related Field Ten Years From Now			
High and Low Graduating Institutions		Males % (N)	Females % (N)
Above Average	1	84.1 (82)	77.6 (67)
	2	76.5 (20)	22.3 (19)
	3	68.7 (134)	63.4 (93)
Below Average	4	88.7 (265)	60.0 (70)

* Red color designates lowest percent; green highest.

Elements of the In- and Out-of-Class Educational Environment that Promote and Sustain Women's Interest in Engineering

This project focuses on elements of the undergraduate environment within the control of academic leaders that promote sustained interest in engineering as both a major and career. Figure 3 and 4 display cross-institutional data about environmental factors that influence women's interest in continuing as an engineering major.

As was clear from the group interviews conducted with undergraduate students during the campus visits, peer interactions play a very strong role in sustaining both men's and women's interest in the engineering major.

Grades and time required for coursework are the two items that appeared consistently across institutions as having the lowest levels of agreement among female students.

Figure 3: Means of the Top Three Factors that ENCOURAGE Undergraduate Women's Interest in Continuing as an Engineering Major, by Institutions with Above and Below Average Enrollment of Women*

Top Encouragers	Above Average Graduation Rates of Women			Below Average
	Inst. 1 (N=67)	Inst. 2 (N=20)	Inst. 3 (N=93)	Inst. 4 (N=70)
Engineering student group	3.94	3.95	3.35	3.86
Female group or activity	4.27	4.35	3.32	3.87
Work experience	4.03	3.60		4.10
Enjoyment of subject matter			3.43	

* Scale (1=much discouragement; 2=some discouragement; 3=some encouragement; 4=much encouragement).

Figure 4: Means of the Top Three Factors that DISCOURAGE Undergraduate Women's Interest in Continuing as an Engineering Major, by Institution*

Top Discouragers	Above Average Graduation Rates of Women			Below Average
	Inst. 1 (N=67)	Inst. 2 (N=20)	Inst. 3 (N=93)	Inst. 4 (N=70)
Competition in eng. classes	2.91			
Competition in courses			2.56	3.11
Grades	2.75	2.60	2.66	2.61
Time required for coursework	2.33	2.45	2.21	2.39
Quality of teaching		3.00		

Dissemination and Future Directions

Each institution receives an institutional report that integrates key findings from the questionnaires and site visit, including a cover letter suggesting ways that findings might be used to generate discussion among faculty and students in engineering. The reports include five major sections: (a) Interest expressed by student respondents in engineering as a major and a career (b) Cultural values (c) Attitudes about gender and engineering among faculty and students (d) In- and out-of-class experiences that promote an interest in engineering (e) Recommendations.

In Fall 2007, college deans and the institutional liaison participating in Round 1 and Round 2 site visits will receive a report that shows benchmark comparisons of how their results on key items related to culture from the student and faculty questionnaires compare to the other participating institutions. Their own data will be identified, but data from other institutions will be labeled with pseudonyms.

We are considering ways to expand the impact of the benchmarking data, such as by hosting a small conference to bring together representatives from participating institutions to discuss the implications of the data.