

Perceived Stress among Engineering Students

**Lisa Schneider
Cornell University**

Abstract

Previous surveys of students in Cornell's College of Engineering suggest that, over the past 2 decades, students perceived the workload required in the College, the competition among students, the difficulty of the curriculum, and the prevalence of curved grading systems as stressful to the point of detracting from the quality of their educational experience. Intending to expand on these findings, the College's Committee on Evaluation of the Student Experience identified stress and sense of unhealthy competition as a focus for a Spring 2005 Student Experience Survey. The survey centered on four major areas: 1) stressors and experiences as an engineering student, especially those related to workload, competition, rigor of the curriculum, and curved grading; 2) how students allocate their time; 3) knowledge and/or participation in programs or organizations, and use of other resources in the College; and 4) perceived quality of faculty instruction and TA interaction. A strong and representative student response was obtained, with 938 completed surveys, representing 35.5% of the total student population. Responses identified the top sources of stress for engineering students as: 1) heavy workload in Engineering courses; 2) high level of rigor of Engineering curriculum; 3) large amounts of time required to get assignments done; 4) not getting enough sleep; 5) competition with classmates for grades; and 6) inflexibility of Engineering curriculum. Findings indicate that perceived stress is often inversely related to academic performance (indicated by GPA). However, even when controlling for GPA differences, students' perceived stress levels varied significantly by gender and by ethnicity, as did various student perceptions, experiences, and concerns related to being an engineering student. The value to students of existing support resources and extracurricular programs was also explored. Based on survey findings, the Committee made several recommendations aimed at alleviating student stress.

Survey Development

Previous surveys completed by students in Cornell's College of Engineering (1991 and 1998 College of Engineering Student Satisfaction Surveys; 1994 and 2002 Consortium on Financing Higher Education (COFHE) Surveys; 1998 Women in Engineering and Advocates Network (WEPAN) Survey) suggested that students perceive the workload required in the College, the competition among students, the difficulty of the curriculum, and the prevalence of curved grading systems as stressful to the point of detracting from the quality of their educational experience. Intending to expand on these findings, the 2004-2005 Common Curriculum Governing Board Committee on Evaluation of Student Experience identified stress and sense of

unhealthy competition as a focus for a Spring 2005 Student Experience Survey. The survey centered on four major areas:

- 1) stressors and experiences as an engineering student, especially those related to workload, competition, rigor of the curriculum, and curved grading;
- 2) how students allocate their time;
- 3) knowledge and/or participation in programs or organizations, and use of other resources in the College;
- 4) perceived quality of faculty instruction and TA interaction.

The College of Engineering contracted the services of Cornell's Survey Research Institute (SRI). SRI provided survey development consultation and performed all data collection and analysis. Early phases of the survey development process included convening a focus group of 16 volunteer students in January 2005. The focus group provided insight into student perceptions that was critical for survey design. Once designed, the survey was pilot tested in Spring 2005 with a sample of 32 students. The final survey was administered online during April and May 2005. All undergraduate Engineering students were invited and reminded to complete the survey via e-mail.

Survey Response and Demographics

A strong student response was obtained, with 938 completed surveys, representing 35.5% of the total student population. There were no significant differences in response rates by ethnicity, nationality, major, or class year. Women and students with slightly higher GPAs were statistically over-represented in the sample. However, the actual differences from the overall student population are quite small:

	Respondents	Student Population
Male	67.3%	73.6%
Female	32.7%	26.4%
URM	7.4%	7.8%
Asian American	27.2%	27.4%
International	11.1%	12.0%
White	54.3%	49.9%
All other	0%	2.9%
Freshman	24.2%	25.4%
Sophomore	26.4%	25.1%
Junior	24.5%	24.3%
Senior	24.8%	25.2%
GPA average	3.24	3.20

Time Use

Analyses of time use responses demonstrate the large amount of time Engineering students spend on academic pursuits. A regular weekday for Engineering students involves an average of 11.1 hours spent on academic or paid work, with academic work averaging 10.5 hours and working for

pay averaging 0.6 hours. This leaves relatively little discretionary time, beyond that required for eating, sleeping, and basic grooming. However students do manage to spend an average of 1.5 hours per day on non-academic extracurricular activities.

Responses also indicate that the average engineering student at Cornell is not extremely sleep-deprived on a regular basis. The average number of hours students sleep per night is 7.1 during the week and 8.6 on weekends, except for prelim or exam weeks when that drops significantly to 6.5 hours per night. Nevertheless, 78.2% of respondents report having fallen asleep in class at least once, 48.3% report having stayed up all night on a school night at least once in the current semester and 12.1% did so at least five times in the current semester. For those who periodically do not get enough sleep, 91.3% cite amount of school work as a central reason.

Participation in College Programs and Organizations

The majority of Cornell Engineering students are involved in some type of college educational program or Engineering student organization. Below are the proportions of senior Engineering students who ever participated in these programs or organizations during their time in the College.

Program	Seniors –Ever participated
Academic Excellence Workshops (AEWs) – one-credit collaborative learning supplements to 1 st - and 2 nd -year core math, chemistry, and computer science courses.	35.5%
Undergraduate Research (in faculty research program)	44.2%
Student Project Team – competitive student-run design teams.	26.0%
Peer Tutoring	20.3%

	Seniors –Ever Member	Seniors –Ever Leader
Engineering Student Organization (ESC, SWE, NSBE, SHPE, Ambassadors, Peer Advisors, ASCE, ASME, IEEE, etc.)	73.9%	39.2%

Use of Available Academic Guidance Resources

Of the academic guidance resources available in the College, Engineering students most often turn to teaching assistants (TAs) for guidance. Of the resources listed below, faculty advisors, TAs and course instructors were most likely to *ever* be used by students for guidance. Meanwhile, TAs were most likely to be used multiple times, with 67.3% of students going to a TA three times or more during their time at Cornell. TAs and “other faculty” (other than faculty advisor or course instructor) were most often rated as useful.

Resource	Ever Used	Used 3+ Times	Rated as Useful
Faculty Advisor	92.5%	50.6%	63.9%
Teaching Assistants	87.4%	67.3%	86.0%
Course Instructors	85.8%	52.5%	83.1%
College Student Services staff	50.3%	24.5%	76.0%
Major/Department staff	45.1%	21.7%	84.4%
Other Faculty Member	41.6%	17.3%	86.2%
Diversity Programs staff	9.4%	6.1%	79.3%
Diversity Programs staff (URMs only)	63.3%	48.6%	90.7%

Perceived Stress

The potential sources of stress identified as most stressful among Engineering students shared a common theme of *curricular issues*. The top six sources of reported high stress (with high percentages of students identifying the source as very or extremely stressful) are presented below. Percentages for all respondents are in bold, with male and female comparisons in adjacent columns.

Source of Stress – with % rating source as very or extremely stressful	Overall	Male	Female
Heavy workload in Engineering courses	52.8%	48.4% *	62.1% *
High level of rigor of Engineering curriculum	45.9%	41.4% *	55.1% *
Large amounts of time required to get assignments done	42.2%	42.2%	42.2%
Not getting enough sleep	41.3%	39.7%	44.6%
Competition with classmates for grades	27.3%	25.8%	30.1%
Inflexibility of Engineering curriculum	26.5%	24.8%	30.0%

*Statistically significant at $p < .05$

Subgroup comparisons reveal a higher incidence of perceived stress among female students, and among Asian-American and URM students. White students and male students had the lowest incidence of perceived stress overall.

- While female students reported high stress levels more often than males for 5 of the 6 sources included above, the differences were statistically significant for stress related to heavy workload and to rigor in the curriculum.
- When compared to International students and domestic white students, Asian-American and URM students reported significantly higher levels of stress on all six stressors:**

Source of Stress	URM	AsiAm	Int'l	White
Heavy workload in Engineering courses	61.8%	59.1%	40.4%	50.9%
High level of rigor of Engineering curriculum	63.2%	54.3%	36.6%	41.2%
Large amounts of time required to get assignments done	47.1%	50.0%	34.3%	39.1%
Not getting enough sleep	47.1%	53.0%	39.4%	34.7%
Competition with classmates for grades	39.7%	33.6%	29.6%	21.1%
Inflexibility of Engineering curriculum	36.8%	31.2%	21.2%	23.4%

**All differences reported in this table are statistically significant at $p < .05$

Stress appears to be inversely related to academic performance. For each of these potential sources of stress, those respondents who are highly stressed have significantly lower GPAs (by an average of .19 grade points) than those who are less stressed.

Engineering Student Experiences and Concerns

When asked about their own experiences as Engineering students, respondents indicated high levels of agreement on the following points.

- 74.1% work with classmates to help each other with schoolwork.
 - This was significantly less common among URM and International students.
- 62.4% feel a need to do better than their classmates.
 - This was significantly more common among males and student with higher GPAs.
- 60.2% think the majority of their Engineering course instructors are accessible.
- 54.6% feel they have at least one Engineering faculty member they can go to for guidance or to discuss academic or career goals.
 - This was significantly *less* likely to be true for Asian-American and International students, and *more* likely to be true for URM students.
- 58.1% think curriculum requirements are not flexible enough to allow them to take courses outside of their field of study.
- 50.6% would like to study abroad, but requirements are too constraining.

When asked about their coursework and grade-related concerns over the past semester:

- 42.4% of respondents did not understand the materials being taught in class *once a week or more*.
 - This was significantly more common for female and for Asian-American students.
- For 22.5% coursework was too difficult to keep up with *once a week or more*.
 - This was significantly more common for female, URM, and Asian-American students.
- 24.3% felt they could not cope with all they had to do *once a week or more*.
 - This was significantly more common for female, URM, and Asian-American students.
- 62% of Engineering students feel extremely anxious about their grades *at least half of the time*; 19% feel this way *all the time*.
 - This was significantly *less* common for white students.

Overall, coursework and grade concerns were significantly less prevalent for students with higher GPAs. Also, Asian-American students were *most likely* to not understand material, feel coursework was too difficult to keep up with, have a hard time coping with all they have to do, and feel extremely anxious about their grades.

Teaching

Faculty Instruction

When asked to rate the quality of faculty classroom instruction in the courses they have had at Cornell on a five-point scale ranging from “extremely low quality” to “extremely high quality,” and differentiating between Engineering and non-Engineering courses, students most often rated their engineering courses as being of high quality or medium quality. There was little difference between the ratings for Engineering versus non-Engineering courses.

Approximately one-third of survey respondents followed-up with open-ended comments. The largest number of comments focused on the professors themselves. The negative comments regarding professors addressed issues such as: not being effective communicators and being more concerned about or interested in research, thus making them a less effective teacher. Positive comments included the recognition that despite the fact that they are very busy with their research, professors are always willing to help students out.

Teaching Assistants

When asked to specify the helpfulness of their interactions with TAs (both Engineering and non-Engineering), students indicated that, on average, 60.8% of their interactions with Engineering TAs were either helpful or extremely helpful. They rated 9.6% of their interactions with Engineering TAs as either detrimental or extremely detrimental, and 29.6% as neither helpful nor detrimental to understanding. Engineering TAs were perceived as extremely helpful to students’ understanding significantly more often than non-Engineering TAs. Non-Engineering TAs were significantly more often rated as neither helpful nor detrimental.

Quality of TA Interaction	Engineering TAs Mean %	Non-Engineering TAs Mean %
Extremely detrimental	3.2%	2.6%
Detrimental	6.4%	6.2%
Not helpful or detrimental	29.6%	37.3%
Helpful	39.9%	38.2%
Extremely helpful	20.9%	15.7%

Twenty-two percent of survey respondents followed-up with open-ended comments. Most comments were general in nature, but predominantly positive (52.6%). The positive comments regarding TAs often focused on their approachability and willingness to help. Respondents frequently indicated that TA help was essential for learning course material and passing their classes. However, a sizable minority of students (14.9%) did mention struggles due to language barrier issues with their TAs.

Recommendations

Based on survey results, the Committee on the Evaluation of the Student Experience recommended several courses of action for the college. Key recommendations included:

- 1) Encourage each Engineering department to ensure that (and outline how) a student can graduate in four years even if they do not begin in the major required courses until the junior year.
- 2) Encourage each Engineering department to outline how a student can participate in study abroad for a semester and still graduate in four years and offer one-on-one staff advising to help students plan how they can fit a study abroad experience into their course of study
- 3) Create a Center for Excellence in Engineering Education which would: a) provide teaching training and support for faculty and TAs and b) engage in research and evaluation to inform teaching practices, curriculum development, and student programming and support efforts in the College.
- 4) a. Continue with extensive annual training for faculty advisors of first-year students, and require that all faculty advisors of first-year students attend.

b. Encourage major departments to develop advising guidelines and provide training for faculty advisors.

c. Encourage Engineering Advising office to develop faculty advisor workshops on a variety of topics chosen with input from faculty.
- 5) a. Continue to enhance programs for female and underrepresented minority (URM) students through the Diversity Programs in Engineering office and throughout the College.
b. Encourage major departments to support the participation of female and URM students in all departmental activities, including project teams, student organization leadership, undergraduate research, and other department-affiliated student groups.
c. Encourage faculty to be conscious of diversity in the classroom and to be culturally sensitive in all interactions with students.
- 6) Encourage college faculty and staff to work in collaboration with University initiatives to develop and implement appropriate support services for Asian-American and International students.

Biographical Information

LISA SCHNEIDER has been the Director of Engineering Learning Initiatives in Cornell University's College of Engineering since December 2002. Learning Initiatives' programs enhance the educational environment of the College by providing opportunities for collaborative learning, undergraduate research, teaching skill development, peer instruction, and leadership development. Schneider received her PhD in Sociology from Cornell in 1997.