

Undergraduate Students' Views of the College of Engineering:

Reactions to the Findings from the PACE Survey

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Background

The “Results of PACE Survey of Engineering Undergraduates: University of Wisconsin Madison College of Engineering 2008” was reported by Jennifer Sheridan, Executive and Research Director of the Women in Science and Engineering Leadership Institute. This report summarizes the results of a survey taken by approximately 36% of the College of Engineering (CoE) undergraduate students enrolled in 2008, and also compares these results to their peers from three other institutions—University of Michigan, Pennsylvania State University, and Purdue University. The survey requested information about students’ academic, interpersonal and intrapersonal experiences, as well as their perceptions of engineering. Furthermore, demographic variables, such as gender, transfer student status, race and ethnicity, were used to determine differences between groups.

Dr. Sheridan reported findings from UW-Madison’s PACE survey to a number of groups in early 2009. These results were positively received yet at the same time, a number of faculty and staff wanted examples of actual experiences to complement the quantitative data. To that end, Dr. Sheridan asked if I would run focus groups to capture students’ perceptions about the College of Engineering and to provide reactions to the PACE results. I was hired at 10% FTE time for three months to accomplish this task (approximately 48 hours total to schedule and conduct the focus groups, interview students, analyze data, and write the report). This project occurred during the fall and spring semesters of 2010 (for planning the study, IRB application, scheduling groups and data collection) and spring 2011 (for data collection, data analysis and writing).

Methods

Participants

In spring of 2010, I began identifying participants for the focus groups and used a variety of methods to invite as many students as possible. For example, I contacted students through a distribution list and emails sent out in Associate Dean Cramer’s name. I also announced the focus groups in a number of undergraduate classes so that students recognized me and might feel comfortable participating. The PACE survey results were reported at a Polygon meeting, which was also used as a venue to announce the upcoming groups. Alicia Jackson, the staff member who works with student organizations in the CoE, provided me with the names of current presidents of all of the affinity groups. I contacted each of these presidents individually and requested an opportunity to meet with their members. It was very challenging to get students to commit to these groups, and even when they did, approximately half of the students who said they would attend, actually showed up. Ultimately, despite scheduling eight focus groups and many interviews, ten students participated in the study—eight of whom were senior/senior+ students; two were junior level students in the CoE.

Data Collection and Analysis

Data collected from the focus groups are covered under UW-Madison's Institutional Review Board (IRB) for Human Subjects Research (SE 2010-0213). Before beginning the focus groups, the students signed consent forms and were reminded that this protection provided them with the ability to speak freely and to know that their responses would remain anonymous. Each of the groups was taped to allow me to concentrate on the student's responses and to ask follow-up questions. The tapes were reviewed multiple times and were analyzed for common themes about the students' experiences. These themes were primarily focused on the responses to specific questions (see Appendix A for interview protocol) and as a reaction to particular findings from the PACE survey that were provided by Dr. Sheridan (see Appendix B).

Limitations of the Study

As with any study that relies primarily on qualitative methods of data collection, the following results cannot be generalized to all CoE undergraduate students. They do however, reflect the experiences of the students who responded to the open-ended questions asked of them and provide particular examples and instances that explicate some of the PACE survey results. As such, the respondents hope that their experiences and recommendations are useful to readers of this report.

Findings

View of the College of Engineering

All of the participants spoke very highly about the CoE and indicated that attending UW-Madison was their first choice. Most considered the school on the advice of a parent or teacher, and after researching other institutions. Many wanted a large school and college, and were also drawn to the city of Madison. All came in knowing they wanted to be an engineer and applied accordingly.

When asked if any had considered changing majors, a few indicated that they had seriously considered moving out of the CoE. One interviewee described how she was in two of the more challenging engineering courses in her sophomore year and questioned if her chosen major was a good fit. At the time, she looked at these courses as "weeder" or "gate keeping" courses to see if students could "cut in" in engineering. She also believed that the level of difficulty she encountered was how it was always going to be in the college. A different participant noted that he considered leaving a fair amount, but once he felt he had invested too much time, he "stuck it out." Some of the other students chose to switch majors within the college once they understood the differences between majors. Once committed, even though they found their courses challenging, their job prospects and potential careers motivated them to stay in engineering.

Advising and Teaching

The discussions of teaching and advising received mixed responses, both positive and negative. In particular, the students described their best experiences when talking about their junior and senior (including senior-plus) years in the college. At this later point in their college careers, they felt that their majors were consistent with their strengths and interests, and they also knew “the system.” Previous to these final years however, all of the participants described at least one negative experience or interaction, particularly with advising, math and other prerequisite courses, and with TAs and teaching.

Over half of the students felt that they did not receive helpful advising early in their academic careers and continue to feel that way. Many students only see their advisors in order to get registration requests signed; they have no significant interactions with the advisors. One participant found himself on academic probation without any communication with, or follow-up from, his advisor. Other students complained about advisors missing appointments, which caused these students to miss deadlines. Ultimately, they would use the diagrams of courses to take in their majors, but found that even these recommendations caused problems, as some of the courses are too difficult to be taken concurrently. One student noted, “once you are in an engineering direction, you really can’t get off. There is no room for missteps.” Furthermore, none felt that their advisor was helpful with their career development or was invested in them professionally. Rather, they asked questions of trusted faculty members in their majors or used the Engineering Career Services office for advice.

When asked about teaching, responses were also mixed. Most felt that the teaching was good overall, but not in the lower level courses or in courses they have taken outside of the college. For example, many questioned the pre-requisites in math and, similar to the PACE survey findings, indicated that this department was perceived as particularly poor. When asked to elaborate, one of the participants described how math is taught at a “theoretical” level, yet engineering math is applied and learned with real-world problems. He struggled to find the connection between these two styles of teaching. Another student suggested that having courses outside of the department as conditions of entry leads to “cheating” to get admitted to engineering. The students recommended reforming the system of getting into departments/majors and perhaps having CoE faculty teach the required math courses. The majority of the students also wondered about the usefulness of *Statics* and *Dynamics* as pre-requisites, when they have not seen information from these courses applied in other courses.

The participants indicated that they spend many more hours studying and doing homework problems as compared to their peers in other majors. In general, they feel that engineering majors are the most difficult at UW-Madison. One person explained that the credit for courses in the CoE is arbitrary, and that “the amount of time you need to spend

on a course and your grade is not linear.” To address the difficulty of courses, the students feel forced to work together and primarily find themselves studying in groups. When asked what they do when they face academic difficulties, they admitted to asking their peers for help first. They also use a number of college resources, such as supplemental instruction and drop-in tutoring. If they are unable to get the help they need, they then approach a TA. Only rarely do they admit to seeking out the faculty member. They only seek faculty members who seem approachable and not too busy for help.

Some of the students described faculty as “inaccessible” and “intimidating.” One participant wondered, “Do they care? Some of them, you get the sense that they don’t want to teach.” The best teachers, as described by the participants, provide real-world examples and “care” about their students. They are also sensitive to gender issues—such as ensuring that engineers are described as both “he” and “she.”

Support and Advocacy

Besides seeking academic support, I also asked the students “to whom would you go if you had an issue in the CoE?” The majority admitted to not being faced with a significant situation to deal with. When probed further, most indicated that they would go to department staff or a faculty member they trusted. They also admitted that if they had a “personal” issue, they would not talk to anybody within the college. Rather, they would seek outside help.

I then asked the follow-up question, “have you ever felt singled-out or discriminated against due to a personal attribute?” The majority of participants answered “no” to this question and could not identify a situation in which they felt this way. One female participant however, described how she felt singled out in her lab class by the TA. She was the only female and instead of using her name, would refer to her as “girl.” Other students thought this was funny and continued to call her that throughout the course. She attributed this to the TA being from another country and never having taught before. Although she never reported the TA, she (along with the other participants), noted that if they felt that they had a significant issue with gender discrimination from a TA, they would discuss it with the professor.

One of the female participants remembers a TA in the math department saying, “girls just aren’t good in math.” Similarly, one of the Asian-American participants found her friends joking that she does better in math *because* she is Asian. She noted that, as friends, she “blows off” these comments, but would find it discriminatory if it came from someone else.

A few of the females felt that they were given technical or busy-work, like creating charts or writing an outline, when they would have preferred to work on the substantive parts of a project. They wondered if this was due to their gender or if they were correctly perceived as doing it better (“you make nicer charts” or “you have better organizational skills”). One

female participant noted that she would provide ideas, which were ignored initially, but then were given by a man and “taken up.” One participant noted general stereotypes, such as “women don’t work on cars,” which she felt inhibited female engineers from being involved in some of the car/snow mobile groups. A few also agreed with the finding that there is a “confidence gap” between men and women generally.

When asked about the finding in the PACE survey, “Asian students of all ethnicities have consistently lower satisfaction with their CoE experiences than students in other racial/ethnic groups,” the students pondered this and provided various reactions. Some wondered if there was a difference in perceptions between Asian-American students and those who come from different countries. Some of the participants described self-segregation, where some students would sit together in courses or labs and they wondered if this was a reflection of their discomfort. In general, this finding puzzled the participants and they felt unable to speak for others (an exception to this is for the participants who were indeed Asian-American).

Organizations

The majority of participants noted very high satisfaction with the student organizations in the CoE. Only one of the participants did not belong to an organization during his college career. The rest described the organizations as “inclusive.” The best organizations provide for various levels of engagement and allow students to pick how active they would like to be. In general, the participants described students in organizations as “go getters” and they admitted to being drawn into organization activities at the risk of their academics. They allow for networking, forming study groups, and trying out the engineering role. They also help with building a student’s resume.

A few students highly recommended international or travel-abroad experiences to get engineering students to “think about things outside of themselves.” When asked if they would be interested in a cross-college STEM organization, most said they would but only if it had a specific purpose, mission, or project—“just coming together for the sake of it, isn’t worth the time.” When asked if there were any topic or interest areas that were missing, one student noted a desire for an organization for Asian Engineers, otherwise “there is an organization for everybody.”

Recommendations

The previous sections highlight more negative comments than positive because as the facilitator, I was probing for areas in which the college could improve. To that end, when I asked what the college could do to provide the students with a better experience, the following were identified:

Advising and Teaching

- Do a better job pairing students with advisors or allow students to pick their own advisors;
- Train advisors to better work with students or encourage opportunities (such as open advising) for seniors to advise freshmen and sophomores;
- Allow for more flexibility in majors, allowing students to take some technical or elective classes earlier in their career;
- Review and revise prerequisites for entry into a major. Are the courses “gatekeeping?” Are these courses necessary? Ensure course credits are consistent with the amount of time spent on the course;
- Remove ineffective teachers.

Support and Advocacy

- Ensure a climate that is free from gender stereotypes and discrimination;
- Identify and communicate about college-level staff who do serve in advocacy roles.

Organizations

- Encourage more faculty involvement in organizations (some do not currently have an advisor);
- Develop and promote an organization for Asian engineering students.

Although I was unable to interview a large number of students, the participants were very willing to share openly about their experiences in the CoE. All are graduating with a degree in engineering and persisted despite a few challenges. Their recommendations stem from these challenges, with the hope that the college may improve the environment for their student peers who follow.

Appendix A: Focus Group Questions

1. Why did you choose to come to UW-Madison? Why did you choose your major?

Academics

2. Please describe a “typical” course for undergraduates in the CoE. How do these courses compare to courses outside of the college?
3. Please describe a “typical” teacher in the undergraduate courses you’ve taken in the CoE. How do CoE teachers compare to those teaching courses outside of the college?
4. When you’re struggling academically, to whom or where do you go FIRST? In particular, which of the CoE support services have you used?
5. Please describe the academic advising you’ve received. Has it been generally helpful or not?

Student Activities and Organizations

6. Which of the CoE-based student organizations do you belong to?
7. What is your impression of the organizations found in the CoE? Are there organizations that you wish were offered but are not?
8. How do any of the student organizations you belong to help with, or support, your academic work?
9. Describe your interactions with students outside of the college—where and how do these happen?
10. How interested would you be in a cross-college/university organization centered on STEM (science, technology, engineering and mathematics)?

Problems and Advocacy

11. Please describe a problem or issue you faced in the CoE. How did you handle it? To whom did you go to for support?
12. Have you ever had an experience where you felt singled out based on a personal attribute (such as gender, race, ethnicity, religion, family status, etc.)? Please describe.
13. If you had an issue or problem in the CoE, to whom would you go to for support?
14. Have you ever thought about changing majors or moving outside of the CoE? Why?

General Questions

15. Please review the findings from the Project to Assess Climate in Engineering (PACE) survey (see page 2). Which of these findings are consistent with your experience? Which of them are inconsistent?
16. What could the CoE provide or offer that would make your undergraduate experience better?

Appendix B: Top 10 Findings from Pace Survey

1. Students participating in student organizations have consistently high satisfaction with their CoE experiences.
2. Math courses are singled out as especially poor.
3. A culture of not asking professors for help is evident in the data.
4. TAs are given high marks by students.
5. CoE study centers and job placement help are very highly rated, relative to Big-10 peers.
6. Women students in CoE do not feel marginalized in lab groups (this is contrary to many findings in the literature, so is a very positive findings). Asian students do feel marginalized in lab groups, however.
7. Asian students of all ethnicities have consistently lower satisfaction with their CoE experiences than students in other racial/ethnic groups.
8. Women CoE students report very high levels of experiencing differential treatment based on gender, compared to women in Big-10 peer schools.
9. Women CoE undergraduates have a "confidence gap."
10. CoE students have a very positive view of Engineering as a discipline. This finding does not differ by gender, but does differ by race/ethnicity. (Asian & International students have a less-positive view; Black, Hispanic & White are similar, with Hispanic perhaps the most positive view of all groups.)