A Novice in Assessment Land: Experiences with the 2009 Engineering Student Climate Study

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College of Engineering
University of Illinois at Urbana-Champaign

I-STEM Working Group
April 9, 2010
I’ll talk about three stages of the process

• Before
  – getting started
  – planning the study

• During
  – selected results

• After
  – spreading the word
  – using results to improve education
It started in Summer 2008 with . . .

- A new Associate Dean for Undergraduate Programs (me)
- A new Associate Dean for Graduate and Professional Programs (Vicki Coverstone)
- Perennial issues in engineering education:
  - curriculum (workload, scientific vs. practical content)
  - retention (6 year graduation rate from same college is 67%)
  - diversity (undergrads are 16.7% women, 6.4% minority)

“Let’s do a climate study!”
We asked for professional help

RECRUITMENT, RETENTION, AND PERFORMANCE OF STUDENTS IN THE COLLEGE OF ENGINEERING AT ILLINOIS

Lizanne DeStefano
Jeremiah Johnson
Elisa Mustari
Lisa O’Dell
I-STEM
We sought input and buy-in from many stakeholders

Dean Adesida and Engineering associate deans

Early fall 2008, Lizanne presented a prospectus to:
- Engineering department heads
- Program staff from the College of Engineering
- Student groups (Engineering Council, DSAC, GSAC)
A project advisory board and college staff provided key input and assistance

Project Advisory Board:
• Associate Deans Charles Tucker and Victoria Coverstone
• Susan Larson – Assistant Dean and Director of Women in Engineering
• Ivan Favila – Assistant Dean and Director of Morrill Engineering Program
• M. Angela Dimit – Director of Advancement, Media Communications Specialist
• Andreas C. Cangellaris –Department Head – Electrical and Computer Engineering
• Michael T. Heath – Interim Department Head – Computer Science
• Jong-Shi Pang – Department Head – Industrial & Enterprise Systems Engineering
• Albert J. Valocchi – Associate Department Head – Civil and Environmental Engineering
• Casey Roth – Undergraduate Student – Engineering Council
• Jessica Wood – Graduate Student – Society of Women Engineers

College of Engineering Staff Members:
• Debbi Dillman, Jack Su – Information Services
• Sarah Zehr, Tina Prow, Rick Kubetz, Jim Vattano – Communications
• Kay Kappes, Hedi Pugh – administrative support
We took some time to define the purpose and scope of the study

Purpose
To better understand the entering characteristics, patterns of performance, attrition rates and reasons for leaving, and experiences of undergraduate and graduate students in the College of Engineering (COE) and other engineering disciplines, with particular emphasis on those from traditionally underrepresented groups and other subgroups of interest.

Foci
• **Climate**: academic experience (course taking, advising, research, assistantships and awards, internships, satisfaction), peer relationships, faculty relationships, support services
• **Performance in program**: course enrollment, credit accrual, GPA, transfer/exit status; reasons for exit
• **Benchmarking with peers by department**: enrollment, recruitment, retention, support services and programming
We used several methods

• On-line student surveys
  – Undergraduate, graduate, and former students
• Student focus groups
• Peer benchmarking by department
• Secondary data analysis
  – Course taking, grades, retention
The online surveys were extensive

- **Length**
  - Undergraduates – 143 items
  - Graduates – 141 items
  - Former students – 10 items
  - Multiple-choice and open-ended

- **2 week administration period:**
  January/February 2009
Serious recruitment efforts yielded a strong response

- Multiple strategies:
  - Reminder e-mails with link to survey (dean; dept. head)
  - Webpage, FAQs, link to survey from COE homepage
  - “Countdown clock” on plasma screens in Engineering Hall
  - Posters placed around the Engineering campus
  - Informational flyer
  - *Engineering Update* newsletter
  - Drawing for two $350 gift certificates

- Survey response rate:
  - Undergraduate: 36.2% (n = 2033)
  - Graduate: 45.8% (n = 1131)
Undergraduate survey responses were a good match to the college population

Population

Respondents

82.8%

17.2%

30.1%

69.9%

Male
Female

Male
Female
Undergraduate survey responses were a good match to the college population

Population

Respondents

African-American
Asian/Pacific Islander
Caucasian
Hispanic
International
Unknown

60.8%
14.9%
4.0%
2.3%
16.0%
0.2%
1.7%
17.5%
4.0%
2.0%
3.3%
11.2%
2.0%
0.3%
1.7%
16.0%
0.2%
14.9%
4.0%
2.3%
62.1%
The survey showed good overall satisfaction

Most undergraduate and graduate engineering students reported being satisfied with their experience at the University of Illinois, in the College of Engineering, and in their departments.

“Overall, being an engineer at U of I has been a very rewarding experience. I have made many friends and had such a great time. The challenge of being an engineer here has made me into a much better student and person.”
3. All things considered, how satisfied are you with your experience in the College of Engineering?

<table>
<thead>
<tr>
<th>Category</th>
<th>Undergrad Males</th>
<th>Undergrad Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Dissatisfied</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Somewhat Dissatisfied</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Neutral</td>
<td>15%</td>
<td>14%</td>
</tr>
<tr>
<td>Somewhat Satisfied</td>
<td>40%</td>
<td>43%</td>
</tr>
<tr>
<td>Very Satisfied</td>
<td>37%</td>
<td>35%</td>
</tr>
</tbody>
</table>
3. All things considered, how satisfied are you with your experience in the College of Engineering?

![Bar Chart]

Undergraduate Students' Race/Ethnicity:
- African-American
- Asian/Pacific Islander
- Hispanic
- Caucasian
- International

Satisfaction Levels:
- Very Dissatisfied
- Somewhat Dissatisfied
- Neutral
- Somewhat Satisfied
- Very Satisfied

Values:
- Very Dissatisfied: 3, 5, 2, 49
- Somewhat Dissatisfied: 6, 28, 26, 37
- Neutral: 14, 17, 39, 40
- Somewhat Satisfied: 7, 17, 39, 40
- Very Satisfied: 2, 42, 33, 35
Satisfaction with advising differed between graduate and undergraduate students

- Most graduate students reported being satisfied with their faculty advisors and their departmental advising offices.

- There was wide variation in undergraduate students’ reported satisfaction with the advising services provided by faculty advisors and departmental advising offices.
6. Satisfaction with: Faculty advisor

- **Grad Males**
  - Dissatisfied: 2%
  - Somewhat Dissatisfied: 7%
  - Neutral: 10%
  - Somewhat Satisfied: 12%
  - Satisfied: 68%

- **Grad Females**
  - Dissatisfied: 5%
  - Somewhat Dissatisfied: 6%
  - Neutral: 11%
  - Somewhat Satisfied: 19%
  - Satisfied: 59%
6. Satisfaction with: Faculty advisor

- Dissatisfied: Undergrad Males 11%, Undergrad Females 9%
- Somewhat Dissatisfied: Undergrad Males 15%, Undergrad Females 20%
- Neutral: Undergrad Males 20%, Undergrad Females 17%
- Somewhat Satisfied: Undergrad Males 22%, Undergrad Females 20%
- Satisfied: Undergrad Males 32%, Undergrad Females 35%
8. Satisfaction with: College dean's office

- **Undergrad Males**
  - Dissatisfied: 3%
  - Somewhat Dissatisfied: 7%
  - Neutral: 37%
  - Somewhat Satisfied: 21%
  - Satisfied: 31%

- **Undergrad Females**
  - Dissatisfied: 3%
  - Somewhat Dissatisfied: 6%
  - Neutral: 33%
  - Somewhat Satisfied: 24%
  - Satisfied: 33%
Workload and unwritten rules are issues for undergraduate students

“I feel like the support structure is there. If you’re having trouble in your classes, you can get help with it. The problem is though that too much is expected of the students.”

“I think there are (unwritten rules)...in particular, when it comes to my advisor.”

“When I deal with people, I never know what to do. I have no idea what was expected of me.”
20. Level of agreement with: I am overwhelmed by the workload in my technical courses

- **Undergrad Males**
  - Strongly Agree: 12%
  - Moderately Agree: 22%
  - Slightly Agree: 27%
  - Neutral: 20%
  - Slightly Disagree: 14%
  - Moderately Disagree: 4%
  - Strongly Disagree: 2%

- **Undergrad Females**
  - Strongly Agree: 14%
  - Moderately Agree: 24%
  - Slightly Agree: 36%
  - Neutral: 14%
  - Slightly Disagree: 7%
  - Moderately Disagree: 4%
  - Strongly Disagree: 4%
20. Level of agreement with: I am overwhelmed by the workload in my technical courses

- Grad Males
- Grad Females

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Grad Males</th>
<th>Grad Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>27%</td>
<td>20%</td>
</tr>
<tr>
<td>Moderately Agree</td>
<td>36%</td>
<td>37%</td>
</tr>
<tr>
<td>Slightly Agree</td>
<td>37%</td>
<td>26%</td>
</tr>
<tr>
<td>Slightly Disagree</td>
<td>26%</td>
<td>30%</td>
</tr>
<tr>
<td>Moderately Disagree</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>12%</td>
<td>13%</td>
</tr>
</tbody>
</table>
16. Level of agreement with: There are many unwritten rules concerning how one is expected to interact with other students.
16. Level of agreement with: There are many unwritten rules concerning how one is expected to interact with other students

[Bar chart showing the levels of agreement with unwritten rules among Grad Males and Grad Females. The chart includes responses for Strongly Agree, Moderately Agree, Slightly Agree, Neutral, Slightly Disagree, Moderately Disagree, and Strongly Disagree. The percentages for each category are provided.]
Most students report that discrimination was “not a big problem” in their departments

- Responses from African-American students are different from other groups, indicate more of a problem with discrimination

- Insensitive or disparaging comments are more likely to come from other students than from faculty or TAs
24. Agreement with: Racial/ethnic discrimination is a big problem in my department

- **Strongly agree**: 1%
- **Tend to agree**: 17%
- **Neutral**: 17% (Undergrad Males), 19% (Undergrad Females)
- **Tend to disagree**: 19% (Undergrad Males), 21% (Undergrad Females)
- **Strongly disagree**: 63% (Undergrad Males), 60% (Undergrad Females)
24. Agreement with: Racial/ethnic discrimination is a big problem in my department

Undergraduate Students' Race/Ethnicity

- African-American
- Asian/Pacific Islander
- Caucasian
- Hispanic
- International

Strongly Agree: 0%
Tend to Agree: 55%
Neutral: 30%
Tend to Disagree: 16%
Strongly Disagree: 14%

Strongly Agree: 3%
Tend to Agree: 69%
Neutral: 26%
Tend to Disagree: 15%
Strongly Disagree: 12%

Strongly Agree: 68%
Tend to Agree: 42%
Neutral: 31%
Tend to Disagree: 28%
Strongly Disagree: 16%

Strongly Agree: 48%
Tend to Agree: 72%
Neutral: 31%
Tend to Disagree: 28%
Strongly Disagree: 16%
20. Agreement with: There is equal access for people of all races/ethnicities to lab/research opportunities

- Undergrad Males
- Undergrad Females

<table>
<thead>
<tr>
<th>Response</th>
<th>Undergrad Males</th>
<th>Undergrad Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>6%</td>
<td>3%</td>
</tr>
<tr>
<td>Tend to disagree</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Neutral</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>Tend to agree</td>
<td>19%</td>
<td>26%</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>51%</td>
<td>48%</td>
</tr>
</tbody>
</table>
20. Agreement with: There is equal access for people of all race/ethnicities to lab/research opportunities

Undergraduate Students' Race/Ethnicity

- African-American
- Asian/Pacific Islander
- Caucasian
- Hispanic
- International

Strongly Disagree: 4, 7, 3, 4
Tend to Disagree: 10, 5, 6, 8
Neutral: 24, 25, 24, 26, 27, 29, 19, 16, 30, 21
Tend to Agree: 33, 57, 54, 42
Strongly Agree: 4, 7, 3, 4
7. How often have FACULTY made insensitive or disparaging comments about racial/ethnic minorities?

- **Never**:
  - Undergrad Males: 92%
  - Undergrad Females: 91%

- Once or twice a year:
  - Undergrad Males: 5%
  - Undergrad Females: 7%

- Once or twice a semester:
  - Undergrad Males: 2%
  - Undergrad Females: 2%

- More than once a month:
  - Undergrad Males: 1%
  - Undergrad Females: 0%

- Weekly:
  - Undergrad Males: 0%
  - Undergrad Females: 0%
8. How often have TEACHING ASSISTANTS made insensitive or disparaging comments about racial/ethnic minorities?
9. How often have STUDENTS made insensitive or disparaging comments about racial/ethnic minorities?

- **Never**: 43% (Undergrad Males), 40% (Undergrad Females)
- **Once or twice a year**: 16% (Undergrad Males), 24% (Undergrad Females)
- **Once or twice a semester**: 17% (Undergrad Males), 25% (Undergrad Females)
- **More than once a month**: 14% (Undergrad Males), 5% (Undergrad Females)
- **Weekly**: 11% (Undergrad Males), 6% (Undergrad Females)
The study identified a number of **scales**

- Scale: a set of survey questions for which each individual’s answers are highly correlated.
- Identify the set by statistical analysis, then read the questions to determine the conceptual focus
- Scales provide a more precise measure than single questions

- Some important scales:
  - General Student Satisfaction
  - Departmental Climate
  - Academic Advising
  - Departmental Non-Racism
Average Scale Scores – Undergraduate

<table>
<thead>
<tr>
<th></th>
<th>Male Undergraduates</th>
<th>Female Undergraduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Satisfaction</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>Departmental Climate</td>
<td>3.9</td>
<td>4.0</td>
</tr>
<tr>
<td>Academic Advising</td>
<td>3.7</td>
<td>3.7</td>
</tr>
<tr>
<td>Departmental Non-Racism</td>
<td>4.1</td>
<td>4.0</td>
</tr>
</tbody>
</table>
Undergraduates, General Satisfaction Scale

![Bar chart showing mean general satisfaction for different groups: African-American, Asian/Pacific Islander, Caucasian, Hispanic, and International students. The means are as follows: African-American 4.0, Asian/Pacific Islander 3.7, Caucasian 3.9, Hispanic 4.0, and International 3.8.]

Mean

0.0 1.0 2.0 3.0 4.0 5.0

General Satisfaction

African-American  
Caucasian  
Asian/Pacific Islander  
Hispanic  
International
Undergraduates, Academic Advising Scale

![Bar chart showing mean scores for academic advising across different ethnic groups.]

- African-American: 3.8
- Asian/Pacific Islander: 3.6
- Caucasian: 3.7
- Hispanic: 3.8
- International: 3.7
Undergraduates, Dept. Non-Racism Scale

![Bar chart showing the mean scores for different racial groups in departmental non-racism.](chart)

- African-American: 3.3
- Asian/Pacific Islander: 3.8
- Caucasian: 4.2 (two instances)
- Hispanic: 4.2
- International: 3.7
Digesting the data was harder than I thought it would be

- A big report arrived in August 2009

- 873 pages later, I still wasn’t sure what we had learned

- A PowerPoint presentation from I-STEM helped everyone’s understanding immensely
In spring 2010 I-STEM made presentations to multiple stakeholder groups

- College of Engineering program staff
- Department heads
- Department staff with undergrad/grad education responsibility
- Engineering Council (students)
- Dean’s Student Advisory Committee (undergraduate students)
- Graduate Student Advisory Committee
- College Executive Committee (elected faculty reps)
- I-STEM Working Group
Reception of the results has been quite positive

- Students liked that we asked them about their experience
  - found the results generally consistent with their experience
  - made plenty of suggestions for improving the college
  - suggested exploring curricular issues more in the next round
- Department heads and faculty were engaged with the results, interested in improving the student experience
  - College Executive Committee provided a report with recommendations for follow-up
- Results that surprised some groups didn’t surprise others
  - e.g., “more racist/sexist comments from other students than from faculty or TAs”
- A few curious bits need more exploration
  - “my confidence in my mathematical abilities has decreased”
Moving from survey results to curricular and climate improvements is a work in progress

- Many ongoing activities aimed at improving students’ educational experience and student diversity
  - Academy for Excellence in Engineering Education
  - iFoundry
  - Core Conversations in Engineering Undergrad Education
  - Math/COE Calculus Project
  - Women in Engineering
  - Morrill Engineering Program
  - . . .
- Few of these have made immediate use of the survey results
We are making plans for another survey in spring 2011

- Envision a biennial pattern
- Choose a few items to track over time (scales!)
- 2009 survey emphasized climate and diversity; 2011 survey will explore curriculum more deeply
- College staff will do more of the work
We did many things right the first time

Before
• Had strong support from Dean Adesida
• Sought professional help from the start
• Engaged stakeholders early and substantively
• Took some time to set the goals and scope
• Invested resources to get a good response rate

After
• Packaged the results in an understandable format
• Re-engaged our stakeholders and sought their reaction
Places I’ll do better next time

Before
• Keep the focus tight, and the survey short
  – won’t hesitate to assert my goals for the study
  – tie questions to groups who will take action afterwards
• Allocate time, engage partners to push the project along

After
• Save some energy to publicize early results, esp. with students
• Digest survey results quickly, then follow up with focus groups
• Be mindful of moving from data to programmatic action
  – integrate the study with college and departmental programs
Thanks!