AC 2011-325: TEACHING BELIEFS OF ENGINEERING GRADUATE STUDENTS

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Teaching Beliefs of Engineering Graduate Students

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Introduction
Many engineering programs are seeking to integrate more hands-on activities and active learning in lower-division courses, which require more facilitation than the traditional large lectures, and more and more graduate students are assuming teaching responsibilities. The purpose of this research is to provide exploratory data on the teaching beliefs of engineering graduate students. These findings have the potential to help determine what kinds of problems engineering GTAs face and what kinds of training or support are needed to empower GTAs in their teaching responsibilities.

Factors that can influence a person’s teaching beliefs include his or her own experience as a student, previous teaching experience, and by mentoring experiences. These beliefs then influence the teacher’s teaching style. Teaching philosophies range from teacher-centered to student-centered (Saroyan et al., 2009). Using examples from this framework, we developed a survey to explore GTAs’ teaching philosophies based on their perceptions of their own responsibilities and of their students’ responsibilities.

Survey Instrument
1. Students learn better by actively participating (such as joining in class discussions and completing hands-on activities).
2. I discuss with my class how this course fits into Students learn better by actively participating (such as joining in class discussions and completing hands-on activities).
3. I have adjusted course activities based on student interests or feedback.
4. I encourage students to visit me in my office hours.
5. I know more than half my students’ names.
6. I do not anticipate interacting with any of my students after the semester ends. (Reverse scored)
7. In ten years, I anticipate teaching being a significant part of my daily activities.

Analysis and Results
Responses to each item were assigned a score of 1 to 4, where 1 represented “Strongly Disagree,” 2 was “Disagree,” 3 was “Agree,” and 4 was “Strongly Agree.” Item 9 was reverse scored. The scores were then summed to a total ranging from 10 to 40, where 40 represented a highly student-centered teaching philosophy and 10 represented a highly teacher-centered teaching philosophy. The mean score was 29.8, with a standard deviation of 4.0. A factor analysis did not identify any significant factors, which support our assumption that these items all represent the same construct. The internal consistency of the items used for this analysis was evaluated using Cronbach’s alpha. Based on a score of 0.74, we determined the instrument is moderately reliable.

We conducted Single Factor ANOVA tests or t-tests, as appropriate, on several variables to look for differences in total scores between groups, with a significance level of 0.05.

<table>
<thead>
<tr>
<th>Variable</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
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</tr>
<tr>
<td>Semesters of Teaching Experience</td>
<td>0.294</td>
</tr>
<tr>
<td>Home Department</td>
<td>0.513</td>
</tr>
<tr>
<td>Teaching Department</td>
<td>0.494</td>
</tr>
<tr>
<td>Type of Course Taught</td>
<td>0.011</td>
</tr>
</tbody>
</table>

The only significant variable was the type of course taught. We then used two-tailed t-tests to determine the differences between the types of courses taught: Freshman General Engineering, Major Core Course, Lab Course, or Upper Division Course. The p-values for each test are shown below.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Gen. Eng.</td>
<td>--</td>
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<td>0.030</td>
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<tr>
<td>Core</td>
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<tr>
<td>Lab</td>
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<td>0.012</td>
</tr>
<tr>
<td>Upper Div.</td>
<td>0.742</td>
<td>0.010</td>
<td>0.012</td>
<td>--</td>
</tr>
</tbody>
</table>

Conclusions
First, our study found that graduate teaching assistants in engineering report moderately student-centered teaching beliefs. The average score of 29.8 corresponds with agreeing with each item on the survey (and disagreeing with item 9).

No significant differences were found between groups of graduate teaching assistants based on sex, semesters of experience, home department, or teaching department.

Graduate teaching assistants that taught freshman general engineering course or upper-division courses reported more student-centered teaching beliefs than graduate teaching assistants teaching major core course or lab courses. The reasons for this difference could not be explained based on the data collected.

Future Research
Future research is needed to explain the reasons for more teacher-centered or student-centered in various groups of teaching assistants. Also, larger sample sizes would allow for analysis across departments and greater discriminatory power to identify possibly confounding variables.

References