
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.

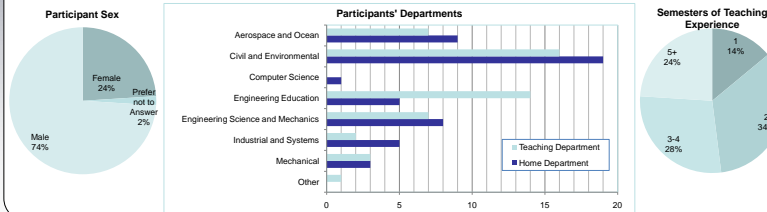
Factors that can influence a person's teaching beliefs include his or her own experience as a student, by previous teaching experience, and by mentoring experiences. These beliefs then influence the teacher's teaching style. Teaching philosophies range from teacher-centered to student-centered (Saroyan 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

- Students learn better by actively participating (such as joining in class discussions and completing hands-on activities).
- I discuss with my class how this course fits into their educational and career goals.
- I frequently tie course material into a larger context than is presented in the text or other material provided by the department.
- I use multiple teaching strategies (such as lecturing, having a class discussion, or group work) to address different learning styles of students during the semester.
- I have adjusted course activities based on student interests or feedback.
- I have thought about how my classroom arrangement influences students.
- I encourage students to visit me in my office hours.
- I know more than half my students' names.
- I do not anticipate interacting with any of my students after the semester ends. (*Reverse scored*)
- In ten years, I anticipate teaching being a significant part of my daily activities.

Participants

Fifty current graduate teaching assistants in the College of Engineering with lab, lecture, or workshop teaching duties at a large, land-grant university in the Eastern United States.



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 Chronbach'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.

Variable	p-value
Sex	0.196
Semesters of Teaching Experience	0.294
Home Department	0.513
Teaching Department	0.484
Type of Course Taught	0.011

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.

	Gen. Eng.	Core	Lab	Upper Div.
Gen. Eng.	--	0.033	0.030	0.742
Core	0.033	--	0.830	0.010
Lab	0.030	0.830	--	0.012
Upper Div.	0.742	0.010	0.012	--

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.

Teaching Assignment	Average Score
Freshman General Engineering	31.1
Major Core Course	27.4
Lab Course	27.8
Upper Division Course	31.5

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

Saroyan, A., Dagenais, J., & Zhou, Y. (2009). Graduate Students' Conceptions of University Teaching and Learning. *Instructional Science*, 37, 579-600.