AC 2008-1966: ASSESSMENT OF A PRESTIGIOUS ENGINEERING GRADUATE TEACHING FELLOWSHIP PROGRAM

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Assessment of a Prestigious Engineering Graduate Teaching Fellowship Program

Abstract

A traditional hierarchy exists in graduate education in which research assistantships are more desirable than workshop leaderships. Unfortunately, this means that some of the best and brightest doctoral students who go on to be faculty never gain teaching experience before they become assistant professors. To counteract these effects, a prestigious graduate teaching fellowship program has been developed at a large state university on the east coast. Incoming doctoral students compete for these coveted assistantships, which award students with a tablet PC, augmented stipend, and increasing teaching responsibility over three years. As this program is in its second year, the quantitative data to support its success in attracting and preparing top graduate students for faculty positions is yet unavailable. In the meantime, we collected and analyzed qualitative data about the students' experience as workshop leaders in College of Engineering first-year courses to determine whether the goal of high-quality mentored teaching experiences is being met. We found that the workload in the freshman courses is similar to teaching assistant workloads in other departments, but that workshop leaders have (and enjoy) more responsibility. Workshop leaders found far greater value in weekly meetings than in training at the beginning of the semester. To varying degrees, these weekly meetings also serve as peer mentoring and community building activities among the teaching teams assigned to each course. There is little communication between graduate students assigned to different courses, even among Graduate Teaching Fellows. Written, qualitative faculty evaluations were very useful to workshop leaders, while quantitative student evaluations using a standardized form were not reflective of the responsibilities of workshop leaders. Recommendations include expanding the faculty teaching mentor role, redesigning the student feedback form, and adding social activities across course assignments.

I. Introduction

Those holding academic faculty positions within a college or university are expected to be active in teaching, research, scholarly publication, and outreach. Doctoral education programs have historically emphasized preparation for research and scholarly publications and perhaps to a somewhat lesser extent for outreach. However, the vast majority of candidates who complete a doctoral program in engineering have minimal preparation and experience in being an educator in the classroom. In this paper, we describe one program designed to directly address this deficiency in doctoral student preparation: the College of Engineering Graduate Teaching Fellow (GTF) Program at a large state university on the east coast. The primary objective of the GTF program is to better prepare interested doctoral students for the rewarding lifetime career of an academic in a university setting, with central programmatic focus on the instructional aspects of being a faculty member. As this program is in its second year, the quantitative data to support its success in attracting and preparing top graduate students for faculty positions is yet unavailable. In the meantime, we can collect and analyze qualitative data about the students' experience in the program to determine whether its goal of high-quality mentored teaching experiences is being met. Graduate Teaching Fellows (GTFs) spend their first year teaching in the common first-year engineering courses, which is the focus of this assessment.

Assessment questions we would like to answer in these first few years of the project are:

1. How does the Graduate Teaching Fellow workload and level of responsibility compare to other departments?
2. Are Graduate Teaching Fellows receiving appropriate training and mentoring for their teaching activities?
3. What is the effect on other teaching assistants of interaction with elite Graduate Teaching Fellows?

The role that Graduate Teaching Fellows (GTFs) and other graduate teaching assistants play in this first-year program is called *workshop leaders*. There is little difference in the way GTFs and other workshop leaders are treated, other than being assigned fewer sections. Because of this, and the interest in interactional effects between the two, we decided to interview all workshop leaders (all graduate students working for the department in a teaching capacity). The term "workshop leader" is used to refer collectively to both Graduate Teaching Fellows and other graduate teaching assistants employed by the department.

II. Description of the Graduate Teaching Fellows Program

New and continuing engineering Ph.D. students at least two years from completion are eligible to compete for these fellowships. A fellow selected for the GTF program may receive up to three years of funding at an annual stipend rate considerably higher than the normal Ph.D. stipend. The Fellow also receives a computer matching the current freshman specification for use while in the program, a free student membership in ASEE, and $2000 in travel support for use in attending a professional research conference and/or ASEE during the second or third year of the Fellow appointment. Fellows must work toward either a Graduate Certificate in Engineering Education or the Future Professoriate Graduate Certificate.

In their first year, GTFs are assigned to teach first-year (freshman) engineering courses. First semester fellows also register for a 1-credit Teaching Practicum. In their second semester, fellows may be given more responsibility co-teaching or developing course materials. The second year of the GTF program provides the opportunities for the Fellow to have major (50%) instructional responsibilities for a sophomore- or junior-level course within their home department. A faculty mentor meets frequently with the GTF, attends their classes, and provides a written evaluation. A similar assignment with less supervision continues in the third year.

The department to which GTFs are assigned in their first year teaches three first-year engineering courses for all engineering and computer science majors in the university. The first semester course is common for all majors, while two different second semester courses focus on design and digital technologies for a subset of majors. Topics listed in the catalog description for the first semester course include: problem definition, solution and presentation; design, including hands-on realization working in teams; modeling and visual representation of abstract and physical objects; scientific computation; algorithm development, computer implementation and application; documentation; ethics; and professionalism. This course also introduces the various engineering majors to aid in major selection. Topics included in the second semester design

course are: the engineering design cycle; patent application and search; basic project management; written and oral communications; computer assisted design and analysis; graphics communication; and working in a team environment. The second semester digital course includes: the engineering design cycle; patent application and search; basic project management; written and oral communications; basic computer organization and Boolean algebra; signal and information coding and representation; and introduction to networking.

During the most recent fall semester, there were 5 faculty and 16 workshop leaders assigned to the first semester course, and one faculty member and one or two workshop leaders assigned to each of the second semester courses because they are off-sequence. In spring, the distribution of faculty and workshop leaders shifts to the second semester courses. Each course is two credits and meets twice a week. One-hour lectures of 125-250 students are taught by faculty members, and 30-student workshops lasting 1½ to 2 hours are taught by workshop leaders. For each course, there is an assigned course coordinator, a faculty member who plans most assignments and prepares PowerPoint slides for both lectures and workshops. Some workshop leaders in the GTF program or with prior experience teaching in the department assist in preparing slides and activities. This past fall, the largest course had two lead teaching assistants who were responsible for preparing workshop slides (which were then approved by the faculty course coordinator) and running the weekly course meeting. Though this meeting is intended for workshop leaders, faculty often attended and participated as needed. Each course has common exams and assignments. Faculty meet weekly to discuss new content, logistics, tests and exams. Workshop leaders are not assigned to specific faculty members because of undergraduate student scheduling. Most undergraduates have workshop two days after lecture in the same time slot (e.g., MW 10am), so as many as five workshops are held simultaneously by five different workshop leaders. As a result, course coordinators deal centrally with logistics, content, and planning, as well as supervising up to 16 workshop leaders and five undergraduate graders.

A full workload for workshop leaders is nominally 20 hours per week. Full-time workshop leaders are assigned four workshop sections (6-8 hours). Workshop leaders are also required to attend the weekly meeting (1 hour), attend at least one faculty lecture (1 hour), hold one office hour for each section assigned (4 hours), and prepare for class. Undergraduate graders are hired to grade routine homework assignments. Faculty grade tests and exams. Workshop leaders grade key assignments, such as those related to the semester design project. Students in the GTF program are assigned three workshop sections, with the expectation that they will spend the extra time developing new materials for the course.

III. Assessment Methods

The principal data source for this formative assessment was interviews with workshop leaders in the department. All workshop leaders (graduate teaching assistants including GTFs) were invited to participate. Toward the end of the fall semester, 13 workshop leaders were interviewed in four small focus groups by a graduate assistant with teaching experience in another department. The sample included five women and four GTFs. (The GTF program has six new fellows this year and five continuing from the previous year. Their home departments include Civil Engineering, Mechanical Engineering, Computer Science, and Engineering Science and Mechanics.) Eleven of the thirteen interviewed taught in the first semester course; two others taught the second

semester design course (which was taught off-sequence in fall). Eight had previous teaching experience in other departments or universities. Students' motivation for teaching ranged from simply earning money to testing their interest in a teaching career to gaining experience for a faculty career.

The interview protocol included these questions:

1. Are you a GTF or a GTA? How long have you been teaching for the department? Which course are you assigned to?
2. What do you want to get out of being a GTA?
3. What kind of workload have you had? How does this compare to other departments?
4. What training did you get? Was it effective/helpful for what you've done?
5. What suggestions do you have for training?
6. Tell me about working with the other GTAs in the department. How much interaction do you have? How has working with other GTAs impacted your development?
7. Are you interested in doing classroom research? What kinds of things are you interested in investigating?
8. What kind of feedback would you like to get for your teaching?

For this paper, questions 3, 4, 5, 6, and 8 were analyzed to address the assessment questions listed above. Responses were coded into categories, which became individual paragraphs in the results section. The categories are grouped generally by assessment question.

IV. Assessment Results
A. Workload and Responsibility

In general, workshop leaders thought the workload was realistic. As discussed below, their level of responsibility was higher than many had in past teaching assignments, which may have made the work seem more satisfying. However, workshop leaders cited a number of ways that their workload is increased in unexpected ways. Workshop leaders wanted more time to prepare, specifically having at least 24 hours to customize lesson slides before their first workshop. They also wanted more information about what topics and activities were approaching in the next few weeks. As an additional time commitment, office hours can run over when needy students visit. Finally, since these courses surveyed a wide range of engineering topics, workshop leaders spent more time learning new content than they might if teaching in their degree-granting department. At least one workshop leader spent up to two additional hours per week doing the homework assignments so s/he could be prepared when students came to office hours with questions. Another stated that helping students for additional hours was far more desirable than preparing for class for additional hours.

Office hours was a particular complaint. Graduate assistants mentioned sitting for hours alone waiting for students to come visit, or only seeing three students in office hours all semester. One switched his or her schedule to appointment-only office hours after surveying students and weighing the benefits against consequences. This workshop leader reported that students were satisfied with this arrangement. Graduate assistants were allowed to hold office hours in their regular office (surrounded by other work to fill downtimes), but others did not have convenient

offices, and these may have been the ones having the most difficulty with this aspect of workload.

These workshop leaders didn't have to grade many assignments, but "inconsistency" and "mistakes" on the part of undergraduate graders added to graduate workload (i.e., entertaining questions and protests) and could negatively impact student opinions of their instructors. Grading routinely took at least three weeks in the largest course, and papers were occasionally misplaced. Many times it was unclear to the undergraduate students why points were taken off for a particular problem. One workshop leader mentioned s/he is happy to change homework grades due to grader errors. Because they did not grade routine homework assignments, a few workshop leaders mentioned they felt out of touch with student progress. However, if a change is made to add all grading to workshop leader loads, then the number of sections assigned should be reduced accordingly.

In terms of degree progress, a few workshop leaders pointed out that after having research assistantships, teaching assignments seem to reduce research progress. One described this as "taking time out" to get teaching experience.

Workshop leaders were happy with increased responsibility for running class sections every week. In past teaching assignments, various workshop leaders have graded or monitored laboratories for other departments, resulting in an inconsistent and monotonous workload. For example, some weeks no assignments were due, while others required over 20 hours of grading to provide timely feedback to students. Being responsible for a specified number of sections each week resulted in a more consistent workload. One exception was in grading the final reports for student projects, which can be tremendous work at the end of the semester, compressed due to end of semester grade entry deadlines. Some workshop leaders mentioned a desire to develop or adapt the grading rubric for this assignment, rather than using one developed by course coordinators. Workshop leaders cited good organization of the course overall as a necessary and desirable feature of teaching in this department. While they may question the educational value of PowerPoint slides, they appreciate having slides prepared for them every week with the understanding that they may customize the presentations as desired.

B. Training

Training available to graduate assistants included a multi-day session presented by the Graduate School and required for new workshop leaders, a half-day to two-day session for each course, and weekly course meetings. Because of their GTF position, personal interest, and/or desire to complete a Graduate Certificate in Engineering Education, some had also taken graduate engineering education courses as well.

Workshop leaders who attended the Graduate School session were unanimous in reporting that it was "not very helpful." They explained that the material was either too specific to be relevant or too general to be useful. One specific example was preparing a lecture for a psychology course; the engineers had difficulty seeing any transferable use for this material. This suggests that it may be more effective to offer GTA training at the college level for general topics specific to laboratories, team projects, and problem-solving.

Graduate assistants had little to say about course-specific meetings and training before the semester, but were enthusiastic about the weekly meetings (run by the same people). New workshop leaders and experienced ones reflecting on their initial experience with the department cited a "big learning curve" associated with diverse course content and first-year or first-semester students with a wide range of preparation and abilities. The weekly meetings played an important role in ongoing training, conveying information in manageable chunks, and as an outlet for asking questions. On the other hand, workshop leaders wanted a better sense of what activities, topics and events were upcoming in future weeks. In particular, when undergraduate students asked what they are doing next week in class, novice workshop leaders often did not have an answer. These weekly meetings were limited to one hour a week due to teaching schedules, but appeared to be the central activity for training and mentoring among workshop leaders. Community development among students and faculty is discussed in more detail in the following section.

Technology was an important topic to include in future training. Blackboard, the university's online course management system, was mentioned often. Some students said a session on the program (which may have been included in the Graduate School training) was good, while others who missed the session said they would like more help with Blackboard. One hour was cited as an appropriate length for Blackboard training. The software used in the courses was also an issue, and this past semester, it was LabView that workshop leaders needed help learning or relearning. Difficulties integrating new software for the first time were exacerbated this particular semester by relatively untested learning activities and few workshop leaders with strong experience using and teaching the software.

Additional topics identified for training include: classroom management (particularly when computers distract students), dealing with student excuses, writing on the chalkboard, interactive learning techniques, time management, and possibly public speaking. Most of these were mentioned in at least two different focus groups.

Workshop leaders who had taken Preparing for the Engineering Professoriate, Foundations of Engineering Education and Teaching Practicum courses described ways in which the courses supported their teaching. For example, the Professoriate course discussed syllabi and course planning, which helped workshop leaders understand the overall course structure. The Practicum course provided additional time and support for discussing ongoing challenges in teaching. However, given the number of GTFs interviewed who were required to take the Practicum course, it is disappointing that many of them did not mention this as training (or feedback or mentoring) they received.

C. Mentoring and Feedback

Workshop leaders identified two different types of feedback they receive on their teaching: faculty evaluations and student evaluations. Each semester, one faculty member is assigned to observe and evaluate each workshop leader using the form included in the appendix. A standardized university mid-semester teaching evaluation is also completed by students in workshop.

Workshop leaders considered the faculty evaluations to be very useful feedback. Students explained that the faculty member visited their class for 20-30 minutes and used the form to provide feedback on what they are doing well and what to improve. It should be noted that a prior version of this form included quantitative scores, but graduate assistants requested they be removed if the intention of this activity is indeed constructive feedback only. There did not appear to be any difference in perception of the value of feedback between students who were evaluated by faculty they knew (because they were assigned to the same course) and students who were evaluated by faculty or department administrators they did not know.

Workshop leaders were less enthusiastic about the way that student evaluations were completed. The standardized form includes questions about the textbook and grading of assignments, aspects of the course over which workshop leaders have little (if any) control. Not only is this information useless to workshop leaders, but some believe it confuses students about who is responsible for various aspects of the course. The workshop leaders themselves were so confused about the results of these evaluations, that at least one requested to have a faculty member help interpret the feedback. It is clear that since standardized teaching evaluations are not required for workshop leaders (as they are for faculty), a new form should be designed that is more appropriate to their responsibilities as workshop leaders. One suggestion was to ask about specific workshops, perhaps every three weeks to provide more detailed feedback to workshop leaders. A new form was designed with feedback from faculty and graduate students by adapting the standardized form and adding questions specific to the responsibilities of workshop leaders.

D. Peer Interaction

The nature of teaching assignments in this department, namely large groups of workshop leaders assigned to just three courses, allows a high level of peer interaction and support. The center of this appears to be the weekly course meetings for the largest course each semester. Graduate assistants, most of whom were assigned to this course, described differing levels of interaction with their peers. Some really enjoyed discussing their teaching difficulties and accomplishments in these weekly meetings, at a nearby restaurant and bar after hours, and a few times during a social event at the home of one of the course coordinators. Others were less connected. Several cited the two lead workshop leaders in the largest course as excellent resources, always willing to help or just talk. Another place workshop leaders mentioned as a meeting location was in the course storage room which includes their mailboxes and some course supplies. After a workshop (up to five are scheduled at the same time), leaders met up in this room to drop off supplies and assignments for the graders. One explained that if this room was larger, and if workshop leaders had keys to this room so they could access it after hours, they would spend more time talking with each other about what happened in class. None mentioned socializing with other workshop leaders during office hours, but it is likely that their schedules do not overlap in this way.

Because of the many course meetings, workshop leader communities form around courses. Some of the regular workshop leaders had never heard of the GTF program, and GTFs had no idea who else was selected. While workshop leaders assigned to the largest class had access to a large group of peers, the experience was very different for workshop leaders assigned to one of the smaller courses. In the smaller design course, workshop leaders attended the one lecture for the

course at the beginning of the week, and met immediately afterwards with the course coordinator. In this meeting, they had more input in evaluating the course materials than most workshop leaders assigned to the larger course. Additionally, these workshop leaders knew that they were being trained to act as leaders in the spring when many more workshop leaders would be assigned to the same course.

Independent of their assignment, workshop leaders cited a few other ways they interact with each other in support of their teaching. Some attended each others' workshops to see how others present the material or deal with students. Some worked together on the problem sets. One mentioned it is "good to have someone to vent to" when duties or students become overwhelming. Perhaps most importantly, workshop leaders recognized and valued the diversity of backgrounds and experiences on their course teams. For example, international workshop leaders have experience in other educational systems. Since the courses attempt to cover all engineering disciplines, at various times different workshop leaders have the expertise to develop a lesson and/or help others learn the content. More experienced workshop leaders didn't hesitate to offer advice on teaching in general or the course and department specifically.

V. Recommendations

A. Graduate Teaching Fellow Program
- Assign a faculty teaching mentor to each first-year workshop leader. All department faculty (except course coordinators) would serve in this capacity to alleviate course coordinator workload. Mentors would observe the workshop leader in class, complete the faculty evaluation form, and meet with the workshop leader to interpret feedback from student and faculty evaluations.
- Add a few social events to link GTFs and workshop leaders across course assignments. The GTF program should have a reception each year to welcome new fellows and reunite continuing fellows.
- Consider ways in which office hours can be scheduled and/or located to encourage socialization and/or increase efficiency.
- Talk with the Graduate School about engineering-specific TA training.
- Reevaluate the ability, willingness, and time constraints of GTAs with respect to developing course content.

B. Assessment Plan
- Redesign the evaluation form for student feedback to workshop leaders with input from workshop leaders.
- Interview second year GTFs about their experiences teaching in the department. What level of reporting and coordination is required to ensure appropriate mentoring and workload?
- Begin to collect quantitative program evaluation measures: official university teaching evaluations for second and third year fellows, graduation/completion rates, and job placement.
- Continue faculty and student evaluations of workshop leaders.

VI. Acknowledgements

Appendix: Faculty GTA Evaluation Form

Course:
GTA Name:
Date:
Meeting Time and Room:
Observed by:

Criteria	Great job on…	Areas for Improvement
Preparation: • Can explain hw/quiz solutions & grading policies • Knowledgeable about underlying engineering concepts • Anticipates potential student pitfalls		
Presentation Skills: • Confidence and projection • Clarity of speaking and explanation		
Classroom Control: • Students are behaved and on task • Most students understand what is happening		
Attitude: • Enthusiasm • Positive attitude toward material and activities • Reinforces and references **lecture**		
Empathy: • Understands and addresses student difficulties		

Evaluating Faculty: Please write something in each block to ensure plenty of feedback. Return sheets to --- for copying and distribution to GTAs. Thanks!