Helping Graduate Students Learn to Become Excellent Teachers

Panel on:
Training and Professional Development of Teaching Assistants

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Joint Math Meetings, January 11, 2013
Key Question:

How can we stimulate mathematics graduate students to develop into excellent teachers?

Working with graduate students is particularly important since these graduate students will go on to be the next generation of university faculty members.
Two Seminars, Required (1 credit each; meet weekly for 75 minutes for an entire semester).

- Graduate Teaching Seminar I: aspects of being a TA (recitation section leader). Taken first semester of graduate school.
- Graduate Teaching Seminar II: learning to teach your own class. Taken fall semester of second year.

Seminars are taught by Department Chair and Graduate Vice Chair (both research-active faculty members)

Each seminar includes a mix of practice, discussion and Case Studies analysis.
Pre-Semester Graduate Student Orientation

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Discussion of teaching. Ask students: what is the most important thing to do to be a successful TA?
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Answer: prepare thoroughly for each meeting.
Graduate Seminar I, First Step: Starting to Think About Teaching

Have the students grade written work. See the range of possible answers from students. Use this as a springboard to discuss the differences among kinds of errors, and what this suggests about student learning.
1. Find the derivative of \( y = \sec^2(1 + 3x) \).

Student A:

\[
y = (\sec u)^2 \quad u = 1 + 3x \\
y' = 2(\sec(1+3x))(\sec x \tan x) \cdot 3 \\
= 6 \sec x \tan x \sec (1+3x)
\]

Student B:

\[
y' = 2 \cdot 3 \sec(1+3x) \tan(1+3x) \\
= 6 \sec(1+3x) \tan(1+3x)
\]

Student C:

\[
y' = \sec(1+3x) \cdot \sec(1+3x) \\
\quad \quad \quad \quad \frac{\sec \tan(1+3x) \cdot 3 \cdot \sec \tan(1+3x) \cdot 3}{18 \sec \tan(1+3x)}
\]

Student D:

\[
y' = \tan(1+3x) \cdot 3
\]
Practice giving mathematical explanations, and then receive critical feedback: Presentation of a problem from their recitation section (5 minute presentation by each student).
Cases studies selected from: *Teaching Mathematics in Colleges and Universities: Case Studies for Today’s Classroom* (CBMS Issues in Mathematics Education, Volume 10; AMS).

- Discussion of running a recitation section. Case Study: The Quicksand of Problem Four.
- Discussion of pedagogy and teaching issues related to the derivative. Case Study: Seeking Points.
- Discussion of cheating (prevention; procedures if suspected). Case Study: Emily’s test.
- Discussion of motivating students to achieve. Case Study: Study Habits.
Panel on the differences between being a TA and being a Teaching Fellow.

Discussion of how to plan a course and prepare a syllabus

Discussion of how to write an examination. Case Study: Studying the Exam.

Sample lectures (25 minutes): student presentations and critiques.
Graduate Seminar II: First Half

- Discussion of teaching students who have not retained all their pre-calculus knowledge. Case Study: Changing Sections.
- Lecture planning: Students present plans for lectures, which are then analyzed and critiqued by the group.
- Teaching the Fundamental Theorem of Calculus. Case Study: Fundamental Problems.
- Motivation and testing students. Case Study: What Were They Thinking?
- Writing an examination; pre- and post-exam related class discussion. Students bring sample problems before the exam, and after the exam they discuss their exam results.
Graduate Seminar II: Second Half

- Discussion of cheating with an Associate Dean for the College of Arts & Sciences
- Making your classroom interactive: examples and discussion.
- Discussion of using group work. Case Study: Pairing Up.
- Students visit classrooms of master faculty teachers.
- Building classroom rapport and promoting student learning: discussion based on classroom visits.
- Discussion of issues that have arisen in participants’ semester of teaching.