

# Nuts and Bolts of Teaching in the Department of Statistics

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## 1 Courses Using Assistance From 1st/2nd-year Students

- Introductory Statistics Courses
  - Stat 200 (Aut, Win, Spr): Elementary Statistics (minimal mathematics)
  - Stat 220 (Aut, Win, Spr, Sum): Statistical Methods and Their Applications (uses algebra)
  - Stat 220E (Aut, Win, Spr, Sum): Statistical Methods and Their Applications (Economics variant)
  - Stat 234/235 (Aut/Win): Statistical Models and Methods (some calculus)
  - Stat 244/245/246 (Aut/Win/Spr): Statistical Theory and Methods (calculus-based, more theoretical)
  - Stat 251 (Spr): Introduction to Mathematical Probability (calculus-based, theoretical)
- Courses with Statistics Prerequisites
  - Stat 226 (Aut): Analysis of Qualitative Data
  - Stat 224 (Win): Applied Regression Analysis
  - Stat 222 (Spr): Linear Models and Experimental Design

## 2 Course Grader Responsibilities

The responsibilities of the grader vary by course and instructor, but generally include:

- Meet with the instructor/CA about grading expectations/process
- Get solutions from CA (check for accuracy)
- Grade papers (timely, accurately, fairly)
- Mark any deductions on the papers
- Give feedback to instructor/CA on student performance

### 3 Course Assistant Responsibilities

The responsibilities of the CA vary by course and instructor, but generally they include:

- Meet with instructor and stay in contact
- Coordinate activities with the instructor(s), other CA(s), and grader(s)
  - Stat 200/220/220E are generally taught in multiple, parallel sections
- Be prepared to attend lecture
  - Certainly as a 1st-time CA
  - Check with instructor
- Write homework solutions, incorporate instructor comments
- Look at graded homework, check a few papers, get feedback from grader
- Sometimes record grades, keep records for class
- Conduct weekly discussion or recitation sessions
  - Present problems, present activities, answer questions, perhaps take attendance
  - Lead exam review sessions
  - Give feedback to instructors on student understanding and problems with the material
- Hold weekly office hours
  - Typically held in Eckhart 131
  - Answer questions without doing homework for the students
- Help grade quizzes, midterm, final
- Post various announcements as the course requires
- Help with the course web page
- Sometimes give/prepare a lecture or a part of a lecture in class

CAs may grade a few homework assignments or at least review a few graded homework assignments so they are in touch with the course and students. It will help them write better solutions and assign points for individual questions. They also can help monitor the grader in order to ensure that the grading tasks are being performed adequately.

Sometimes CAs share responsibilities by taking responsibility for homework solutions and all recitations sessions on alternating weeks. Such an arrangement is acceptable. CAs should be ready for office hours every week even if they are not preparing solutions that week.

CAs are encouraged to read about instructor duties and suggestions as well as their own. Graduate students are generally asked to lecture for a course sometime in their 4th year of study.

The responsibilities of the lecturer in a course mainly include:

- Prepare and deliver lectures
- Hold weekly office hours
- Produce (or contribute to) homework assignments, quizzes, midterms, final exams
- Administer and grade exams
- Coordinate activities with the instructor(s), other CA(s), and grader(s)
- Make class announcements (often through the course web page)
- Contribute insights and suggestions for improving the course

## 4 On Teaching Style

Discussion sessions or recitations provide an opportunity for students to ask questions and experience the topics of the course differently than they did in lecture. Discussion sessions should be informative and helpful for the students, but also can be fun and entertaining. Techniques for increasing participation in discussion sessions also can be used in the lecture environment, and vice versa. Since the time in lecture is very short, the recitations must (and should) play an important role in the course.

### 4.1 The First Day

It is natural to be a little nervous the first day, but if you are prepared you can make a good first impression and establish how recitations will proceed. Here are a few suggestions.

- Enter the room just before your recitation time is to begin
  - The recitation rooms are generally very busy with back-to-back sessions
  - Do not enter a room already in use until 1 minute before your own session begins
- Start promptly by writing your name and the course number on the board. You should also write your email and office hour time/location on the board.
- Introduce yourself to the students: who you are, what program are you in, what experience do you have, what topics in statistics and probability do you find interesting.
- You can tell students what you expect to happen during your problem session. Are you going to work examples? Are you going to ask questions? Do you expect them to bring questions? Will they work problems in small groups during recitation? Announcing your plans and then implementing them in the first (and subsequent) meetings of recitation will set a contract for the class; it sets expectations.
- Find out something about your students, learn their names
  - Perhaps have them fill out a 3-by-5 card with some information (name, email, concentration, year)

- Ask them to share why they are taking statistics and what are some of their expectations.
  - Ask students to fold a piece of paper so that it stands up to make a name card so that you can refer to them by name
  - Ask your instructor for the full roster that includes student pictures
  - Use the students' names in class
  - In later sessions, you can return homework individually and use their full name out loud
- Answer questions about the course: you should be familiar with the course syllabus and general course administration. If you do not know an answer, ask the instructor.
  - Discuss course material: work a couple of problems, do problems like the homework (but not the actual homework), answer questions to clarify homework. You could provide a brief summary of what happened last week. If you make the first question relatively easy and increase the difficulty of questions during the session, then all students can know that they solved some question, but even the better students have to work.
  - Have students do an activity or work in small groups or check an answer with the person sitting next to them. Activities that illustrate course topics in ways that were not done in lecture can help students appreciate the importance and meaning of concepts. They can make students actively engage in thinking about the subject. Ask students if they can give examples or explain ideas.
  - Remain calm. What seems to you like a long time seems short to students. Count to 20 (slowly) when waiting for an answer. The students are getting to know you, and it might take a little while for them to feel comfortable participating and asking questions. Be supportive when they do participate!
  - Ask students to speak clearly. If you cannot hear students well, then ask them to please speak more clearly. You can ask them to raise their hands if they tend to speak simultaneously. Be polite when making these requests.

## 4.2 Organizing Your Discussion Section

*What should I cover?* Pay attention to what is on the homework, what is done in lecture, what the lecturer suggests. Try to identify difficult or interesting topics. Ask your peers what they plan to do. You also can get suggestions from students: at the start of class ask the students to name topics they would like to cover and write the list on the board (or come to class with your own list), then ask students to vote for the topic they want to discuss the most. The instructor might suggest problems to discuss or topics from the previous homework to clarify.

*How should I cover it?* Individual styles of presentation vary. Explore options, such as answering questions, bringing prepared examples and problems, small group work, having students work problems in class, and activities. If you tell students on the first day that you plan to try some styles other than problem solving, then they should be more receptive to trying something new. Try to *plan the recitation around participation* by the students.

People who write about teaching stress the value of active rather than passive learning. Presenting a series of examples that you solve is efficient in terms of getting through material and covering the topics on the homework assignment. However, students might not retain much or think critically about the notes they

are writing. Engaging students with questions and in solving problems makes them consider how well they really understand a concept. A special contribution of recitation can be student involvement in problem solving.

### 4.3 Interactive Teaching

Active learning can be encouraged by getting your students to participate. There are several ways to do this. One of the most basic and useful is asking questions. Ask students questions and wait for them to answer. If you do not get an answer, rephrase the question. Make the questions nontrivial (avoid  $2+5=?$ ), but answerable by at least some of the students. Encourage students to ask you questions. Sometimes it is helpful to pause and think about a student's question before trying to answer it.

When you work problems in class, one choice you can make is whether you present the details of calculations in an example or have the students do some of the work. You could present one example, then ask the students to complete part of a modified or second problem. You can give students a handout that includes space to work a problem. Give students a few minutes to do the work. Have students write answers on the board or tell you their answers. If students know you will have them work in class, then they will be more likely to bring calculators or their text.

You can have students work on problems in small groups or in pairs. For example, when studying confidence intervals, generate multiple sets of data and distribute a data set to each small group. Have each small group form a confidence interval and write an interpretation of what it means. Then have a representative from each group display the confidence interval on the board. Which intervals cover the parameter value? You then can compare and contrast the different ways students phrase their interpretation. Perhaps you would make four data sets and vary the spread and center of the data sets.

A more ambitious idea (since it involves more free-form discussion that you will need to keep focused) is to guide students toward an "argument" between two views. For example, a small group task using descriptive statistics asks the students to role play by pretending to argue pro or con on a proposal. Divide students into two teams of small groups. Each group on a team gets the same data and descriptive summaries and graphs. For example, data may be customer ratings of a Chinese and an Italian restaurant. Groups discuss summaries for about 10 minutes. Have one team argue for something (these survey data show that people prefer the Chinese restaurant) and the other team argue for something else (these survey data do not show any preference). Do students report mean versus median satisfaction rating? Which is an appropriate measure (skew versus symmetric distribution)? Can you use quantiles and displays in your arguments (e.g., what is the effect of outliers)? How do average rating and variability influence the assessment of the data?

*Do you have to entertain?* You do not have to tell jokes, sing songs, and do magic tricks in recitation to accomplish the goals of recitation. Working problems, answering student questions, and reviewing and summarizing course material helps students and is the basic function of recitation. You are encouraged to do other things you feel comfortable doing to increase interest, enjoyment, participation, and understanding. Activities, having students work problems, group discussions, and small group work increase involvement in the recitation. Showing an interesting or funny example and using humor or drama, to the extent that you can, help students be receptive to learning statistics and enjoying recitation. Use examples from your classes and research when possible.

## 5 Department of Statistics Activities Concerning Lecturers/CAs

- Attend Department orientation this week
- Contact the faculty/lecturer for your course now
  - You will need a copy of the syllabus and course schedule
  - Arrange times for regular meetings with course staff
- Senior Lecturer will observe your lecture/session and give feedback/discussion.
- Other faculty may observe your lecture/session and give feedback/discussion.
- Student feedback is given through
  - miderm evaluations,
  - minute questionnaires, and
  - end-of-quarter evaluations by the university.
- Faculty evaluations and student evaluations are kept in Department records
- You should keep your own records (the start of your Teaching Portfolio)

## 6 Common Situations You Should Know About

- Add/Drop deadline is Friday of the 3rd week of classes
  - CAs should refer students to instructors
  - New lecturers may ask faculty instructors or Senior Lecturer for help
- After the end of the 3rd week of classes, students have the following grading options:
  - A student may simply withdraw from the course
    - \* Instructor must give grade of W (or WF=Withdrawn Failing or WP=Withdrawn Passing)
    - \* Traditionally, a student can withdraw up to the moment that the final exam begins
    - \* The instructor can set an earlier withdraw date if students are notified
  - An Incomplete (I) grade requires Department approval (Senior Lecturer or Chairman)
  - The Pass/Fail (P/F) grade is generally given at the request of the student
- Some instructors will ask CAs to take attendance at recitations
  - Usually have students sign in
  - Advise instructor if students are showing up very late or leaving very early
- Be conscious of preferred forms of address
  - How does the instructor want students to address him/her?
    - \* Dr.? Prof.? Mr.? First name?

- Check with instructor
- How would you like students to address you?
- Students with problems outside the classroom
  - First, contact the student’s undergraduate advisor
    - \* Available to instructors on the Registrar roster system: <http://registrar.uchicago.edu/faculty/>
  - There are other university resources for counseling and mental/psychological help
    - \* Student Counseling and Resource Service: 702-9800 and <http://counseling.uchicago.edu>
    - \* Emergency Therapist on Call: 702-3625

## 7 Comments on Cheating

- University Policy states:

“As students and faculty of the University of Chicago, we belong to an academic community with high scholarly standards of which we are justly proud. Our community also holds certain fundamental ethical principles to which we are deeply committed. We believe it is contrary to justice, to academic integrity, and to the spirit of intellectual inquiry to submit the statements or ideas of work of others as one’s own. To do so is plagiarism or cheating, offenses punishable under the University’s disciplinary system. Because these offenses undercut the distinctive moral and intellectual character of the University, we take them very seriously and punishments for them may include permanent expulsion from the University.”
- Talk to your instructor or the Senior Lecturer about the issue of students working together on homework assignments
  - Should working together on homework be allowed? Expected and usual? Forbidden?
  - State your policy and penalty early and often in writing and in words
  - Require acknowledgement of help/common work
  - Require answer in each student’s own words
  - Keep the points available for homework lower
  - Give more points for original writing
- What is cheating?
  - Copying homework from another person or from a previous version of the course
  - Copying on in-class exams/quizzes
  - Sharing calculators? Looking at others papers?
  - Using forbidden notes on an exam
  - Calculators with formulas/messages?
  - Collaborating on independent take-home projects
- How do you know students are cheating?

- Grader must communicate with you
- Check samples of work and look for similarities (but not common textbook phrases)
- Get to know students and the groups of students that know each other
- Make a seating chart during exams
- What should you do if you suspect cheating?
  - Write warning on the homework/exam
  - Photocopy the suspected cheating for proof
  - Consult with faculty/instructor
  - Consult the Senior Lecturer
  - Notify the student's College advisor - ask them to talk to student

## 8 Department Specifics of Interest

- Office hours are held in Eckhart 131. Talk to instructors for times, one (1) hour per CA on days prior to the due date for homework. There is a sign-up sheet posted at Eckhart 131.
- Recitations are held in Eckhart 117, 133, or other rooms when available. Ask Karen in person for a time slot (or have your instructor ask Karen). Allow one (1) hour per recitation on days prior to the due date for homework.
  - Course assistants have sometimes alternated weeks for homework solution preparation and recitations.
- Photocopying for courses: Conserve paper, keep track of your copies for courses since if you report these to Karen, the Department pays for all course copying
- Solutions are often posted on the web, but also in the display cases (see Mitzi for keys), on Eckhart Reserve, or Electronic Reserve
- Textbook: Get a copy of the textbook for your course from Karen.
- Be very careful when photocopying transparencies - they can damage the copy machine.

## 9 The University of Chicago Center for Teaching and Learning

- At <http://teaching.uchicago.edu/handbook> you will find comments on the following and more:
  - Cheating
  - Romantic involvement with students
  - Dealing with problem students
  - The first day of class
  - Outline of the College curriculum