Teaching Statement – John E. Kolassa

I began my teaching career at the University of Chicago as a Ph.D. student, over thirty years ago. I have taught classes to all levels of students, from beginning undergraduate service courses, through undergraduate major courses, service courses for nursing doctoral students and medical students, courses for terminal MS students, courses for beginning Ph.D. students, and courses for advanced Ph.D. students. Each of these classes of courses has its own considerations, which I will discuss below.

**Undergraduate Service Courses:** Universities often teach these courses to students with no prior experience collecting and interpreting data. Key challenges here are to convey the central questions of statistics, and to motivate statistical thinking as coherent and compelling, rather than as an *ad hoc* catalog of techniques. The text that to my mind does this best is Friedman, Pisani, and Purves, *Statistics*, which has gone through a variety of editions. The authors make a compelling case for standard frequentist statistical inference. Disadvantages of this text are, in my opinion, an excessive insistence on purely frequentist approaches, and the use of some definitions (for example, of the standard variance estimator). I also often recommend Devore and Peck, *Statistics: The Exploration and Analysis of Data*, because of its relatively straightforward prose, and real and interesting examples.

While in general I stress concepts over computation in statistical teaching, at this level, because the computation (with the help of a computer package) is trivial, concept and computation are inseparable. I have taught courses at this level using Minitab and SPSS, with computation discussed in class. Homework is approximately weekly, and I generally give exams every 5 weeks.

**Undergraduate Major Courses:** I have taught probability and statistical theory to undergraduates at both Rutgers and the University of Rochester. The challenge, in this case, is to match the level of abstraction to the students’ mathematical level, and the challenge is met primarily through patience. An additional problem when teaching probability is that much of the science traditionally was motivated by the study of games of chance; for students who don’t find such games interesting, motivation is more difficult. I generally try to use examples from fields like clinical trials in place of gambling examples.

**Service Courses for Graduate Students in Other Disciplines:** The challenges here are similar to those in undergraduate service courses, except that students in such courses routinely have exposure to research data and need less motivation in this regard. There is a temptation, however, to presume more mathematical ability that the students possess. Medical students have a culture that stresses large collections of facts over much smaller collections of ideas, and need to be pushed, for example, to see the two-sample *t* test as one technique with two minor variants, for equal and unequal variance situations, rather than two completely separate formulas. Their culture also encourages them to shift attention from statistics to other areas of their curriculum.

I run courses for these students similarly to undergraduate service courses, except that I tend to use the more advanced text like Devore and Peck, and require fewer longer homework assignments. When class size allows, and scientific reproducibility is on the syllabus, I have students give presentations on papers addressing questions of reproducibility.
Terminal MS courses: These courses make up the bulk of my teaching. Our students are expected to enter with calculus through multivariate calculus, and linear algebra. Our emphasis is on graduates who can function as independent applied statisticians, and so the most important information we teach is the selection of the correct statistical method selected from among those that can be implemented by the student in the workplace. Theoretical justification is important, but proofs that are understood heuristically rather than rigorously are acceptable, and calculations not needed directly in the use of a method (ex., moment calculations for rank statistics) are de-emphasized. Computing in these courses is crucial; I generally use R or SAS, as the audience requests. My teaching style is observable through my text *An Introduction to Nonparametric Statistics*, which appeared in 2020.

Beginning Ph.D. courses: This material is presented with full rigor, but without the expectation that students explore areas outside the bounds of lectures and recommended texts. Courses are deeper than the terminal MS courses, in the level of formalism required, and the initiative that can be expected of students in finding or creating their own computing resources. Assessment is primarily via exams and project work, although assignments are given during the semester to help students gauge their own progress. Assessment is key here, since these courses are among the last indicators of whether a student should continue to the Ph.D.

Advanced Ph.D. courses: These courses are primarily vehicles for helping students fill in knowledge, often beyond that found even in advanced texts, but often found in journals and proceedings. Assessment is secondary, and is often in the form of student presentations. My teaching style is observable through my text *Series Methods in Statistics*, now in its third edition.

Independent Study: As director of graduate studies here at Rutgers and at the University of Rochester, I frequently had the opportunity for independent study with a variety of students. Some of these encounters involved helping students who missed material during regular courses, and some of these encounters were needed to repair the damage from MS courses taught by others that went off the rails. Other of these activities involved undergraduate or MS students contemplating PhD study. I used these studies as a recruiting tool for Rutgers programs. I am pleased that a high school student I worked with during Summer 2020 got a published paper, and chose to attend Rutgers starting Fall 2021 as a member of the Rutgers Honors college.

Other Teaching Activities: As an undergraduate, I had a job as a math tutor for calculus courses, and taught a remedial class in a local high school. I currently have a demonstration that I give periodically to middle school classes on statistics in clinical trials. I have participated in middle and high school career panels.

Adaptation to Remote Teaching: Rutgers moved all statistic teaching to video conferencing for the second half of Spring and all of Fall 2020. Adapting to these conditions has required careful attention to pacing of material. Furthermore, documentary material presented during a remote lecture needs to be much more polished and complete than do notes for an in-class lecture. One can move much more quickly on-line than in person; this urge needs to be resisted in order to best serve students.