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Statement of Teaching Philosophy

Statistics courses often makes a bad first impression: students walk away from introductory classes with the idea that statistics is hard, extremely theoretical, or not particularly relevant to everyday life (outside of election season polls and choosing colored balls from a box). The rise of "big data" and "data science" have created a climate where statistics is vital to many different areas of business, government, and science, but only if it masquerades as something "cool". It is important to counter this trend by making statistics accessible, fun, and relevant to students learning statistics for use in other disciplines, as well as students in the field.

Course Structure In my experience, the best courses set students up for success with clear objectives, well-organized reference materials, and numerous sample problems. Ideally, the textbook should complement the lectures; in particular, the lectures and the textbook should provide different approaches to the material, so that students who do not understand one explanation have alternatives which may be more suited to their learning style. Lecture notes or outlines allow students to prepare for class ahead of time, so that lectures can focus on assessing and reinforcing students' understanding the material; they also facilitate student questions on confusing material. For each topic, the lectures and examples should begin with a basic overview of the material, provide more detail to facilitate a more nuanced understanding of the topic, and opportunities for exploration of open-ended problems which encourage students to engage with the material.

Feedback At every stage of the learning process, mutual feedback is important. Feedback from students should shape future lessons, so that examples are relevant and the lecture style is helpful to as many students as possible; feedback to students should clarify misconceptions, identify problems, and provide additional resources (other references, peer tutoring, office hours). Instructors should also be prepared to assist students with situations that may not be directly related to the course material: disabilities, medical problems, or personal issues may affect student performance in class or their ability to learn the material, and accommodating these students can have an incredible impact. As an undergraduate, I received accommodations for a medical condition which allowed me to complete a full load of difficult courses with limited class attendance; my success in graduate school is in part due to those accommodations. I have also frequently had to ask professors to modify class materials to accommodate red-green colorblindness; those modifications encourage good visualization practice and may help others in the class with similar problems.

Course Design Statistics courses are typically designed for a specific audience; introductory classes may be targeted toward students in engineering, business, or scientific disciplines, while more advanced courses may be designed to accommodate majors and non-majors simultaneously. Introductory classes tend to focus on literacy (understanding statistical analyses) while encouraging students to develop competency (the ability to design, perform, and interpret their own analyses); students in these classes do not generally have time to develop fluency (the ability to solve a novel problem and explain the solution and why it is appropriate), while classes for majors generally are designed to encourage students to develop fluency.

Literacy is a prerequisite for statistical competency and fluency; literate students can read and assess

statistical analyses and conclusions. For students in introductory courses, statistical literacy is often the most important goal: students need to be able to think critically about statistical claims, but they do not necessarily need to perform analyses independently or have a nuanced understanding of the theoretical underpinnings of statistical models years after the course is complete. Breaking lectures up with demonstrations, worked examples, and group work reinforces a literate approach to the material, and short assessments (true/false, multiple choice, or short answer questions) provide mutual feedback.

Competency, the ability to correctly execute and interpret a statistical analysis, requires a deeper understanding of the material. Students must engage the topic in a more abstract way and may need to understand some theoretical details; this is often where students with sparse mathematical backgrounds "tune out" or become hopelessly confused. In my experience teaching introductory statistics labs and R programming classes, group discussions, hands-on problems, and individual exploration (working entire problems through start-to-finish) are valuable tools for encouraging students to transition from literacy to competency. I have also found that outrageous and fun topics (zombie apocalypse, velociraptor attacks, data from online dating sites, etc.) motivate students to attempt problems that would otherwise seem too dry or difficult; they also help students remember important examples. Homework problems and open-ended test questions can be used to assess a student's ability to execute and interpret an analysis from start-to-finish.

The ability to apply course material to novel problems easily and independently requires **fluency**. Open ended questions, discussions, and projects can encourage students to develop their understanding of the material and to think critically about the subject, but fluency requires time and exposure to a variety of problems as well as student engagement. Fluency is particularly important (and time-consuming) for computational topics, as students must be able to use the software fluently before they can apply their knowledge to novel problems or understand the intricacies of a particular approach to a problem.

Courses and learning environments which are well-designed, engaging, and responsive encourage students to develop a deeper and more nuanced understanding of the subject matter. As a student, I have experienced courses which exhibited all of these traits; as a teacher, I design courses so that students have multiple types of contact with the material, opportunitites to give and receive feedback, and fun, engaging, and relevant examples.