Teaching Statement

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Statistics courses often make 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.

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, outlines, and code allow students to prepare for class ahead of time, so that lectures can focus on assessing and reinforcing students' comprehension. For each topic, the lectures and examples should begin with a basic overview, then provide details that facilitate a nuanced understanding, encouraging exploration of open-ended problems.

Feedback At every stage of the learning process, mutual feedback is important. Feedback from students should shape the course structure and presentation, so that lectures and written materials help as many students as possible; feedback to students should clarify misconceptions, identify problems, and direct students to additional resources. 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 and their ability to engage with the material; accommodating these students positively impacts the learning environment.

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 for students with a background in statistics. Introductory classes tend to focus on literacy (understanding analyses) while encouraging students to develop competency (the ability to design and interpret their own analyses); students in these classes do not have time to develop fluency (the ability to solve a problem, explain, and justify the solution), while advanced classes usually encourage students to fluency as well.

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. In computational courses, literate students can understand well-structured code and make simple modifications. 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 more thorough understanding of the material. Students must engage the topic abstractly and may need to understand some theory; this is often where students with sparse math backgrounds become hopelessly confused. In my experience, group discussions, hands-on problems, and individual exploration are valuable tools to facilitate competency. Outrageous and fun examples may also motivate students to attempt problems that would otherwise seem too difficult. In computational courses, competent students can write their own code and solve new problems using an established set of tools. Open-ended test and homework problems can be used for assessment and feedback.

Fluency, the ability to apply course material to novel problems independently, requires time and exposure to a wide variety of problems. Open ended questions, discussions, and projects encourage students to develop an understanding of the material and to think critically about the subject. The ultimate goal for most teachers at the end of a course is that students can be trusted to use their knowledge in the outside world: they can discuss a problem coherently, apply "textbook" knowledge appropriately, communicate the logic behind their approach, and interpret the results correctly.

Courses and learning environments which are well-designed, engaging, and responsive encourage development of a more nuanced understanding of the subject matter, whether the goal is literacy, competency, or fluency. As a student, I have experienced courses which exhibited all of these traits; as a teacher, I work to engage students, provide frequent, mutual feedback, and illustrate the subject matter with fun, engaging, memorable, and relevant examples.