Teaching Statement

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I like to start the first lecture of a Statistics course with this statement: *Statistics is the art and science of transforming information into knowledge*. Then I add, transforming knowledge into wisdom is a completely different matter.

Besides breaking the ice, parsing that joke allows me to make a few points about how I plan to conduct the class and what skills I expect the students to develop as every day consumers of statistics provided by others, and as potential producers of statistics themselves. It also provides an opening for dialogue with the students about their expectations from the course.

Art and science: Although I expect the students to master the technical aspects of the statistical procedures we study (at the appropriate level for the class), they must understand that mechanical application of recipes is useless without knowledge of how the recipes work, as well as a good deal of the 'common sense' that is developed only through practice and experience.

Information: Understanding where the data comes from and under what circumstances it was produced is mandatory for any successful statistical analysis.

Knowledge: There are three aspects I like to emphasize:

1. **Understanding**. Being able to find explanations for how and why things happen in a certain way.
2. **Acting**. Once we know how a system works, we can act on it to achieve a goal.
3. **Communicating**. The proof of true understanding is being able to communicate to others what is going on. And Statistics is, among other things, a language for communicating complicated facts and subtle points.

These three aspects are often inseparable. So, at each point during the course, I try to make clear what is the goal of a particular method, or what is going on in a particular example:

- A scientist is communicating a discovery to her colleagues; or to the general public; or to a government official, who will then make a policy decision.
- A health official is making a point to the general public, hoping for a change in behavior; or to Congress, hoping for legislative action
- A doctor communicates a medical fact to a patient, offers options, and states the chances for different outcomes from each option. The patient must make a decision.
- Etc.

The particular goal and audience then guides the choice of statistical procedure. Should a p-value be used? Or is it better to present a colorful plot?

Wisdom: Once the students learn what procedures are appropriate in a given situation, and which can be misleading, that knowledge should be used in an ethical way.

Experience

I have taught many courses in Mathematics (at the University of Florida, at Purdue University, and elsewhere in the World), including Calculus and Precalculus sequences, Linear Algebra, Differential Equations, and Mathematical Logic (both graduate and advanced undergraduate). At the University of Chicago I was the lecturer for an undergraduate course in Statistics, and course assistant for both undergraduate and graduate classes.

At Stanford University I have been the lecturer for introductory Statistics, Biostatistics, and Probability classes, as well as a graduate class on multivariate methods.

My previous experience in teaching Mathematics courses has been very useful in teaching Statistics, but I have enjoyed very much the extra ingredient of interpretation which is necessary in the latter.

Active learning

I used the active learning approach when teaching the course *Statistical Models and Methods I* at the University of Chicago, and it was a very positive experience; I believe this method is well suited for teaching Statistics (especially if the class is not too large), since there are many small hands-on projects that can be easily fitted during class time, or left for the students to do as part of their homework.

Currently, I am teaching Biostatistics at Stanford. One of the goals of the course is to introduce R as a platform for statistical computations, and we are doing that in an active way, making students perform computations of increasing complexity in class; brief mini-lectures explain the features of R more formally *after* the students have been exposed to these features (and often figured them out themselves) by solving practical problems.

I was also co-instructor (head instructor: Susan Holmes) of an intensive, one-week workshop on using R for faculty, postdocs, and researchers in the newly formed Digestive Disease Center at Stanford Medical School. The focus was on making use of sophisticated bioinformatics tools, integrating data of different kinds and from different sources. The participants worked continuously on their computers, while we were able to guide them and help them over syntactical roadblocks. It was very successful.