Teaching statement

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Here are some points in my teaching philosophy accumulated from teaching two undergraduate courses – 36-220 (Engineering statistics and quality control), and 36-217 (Probability theory and Random Processes), from serving as teaching assistant for numerous undergraduate and graduate level statistics courses, and from participating in discussion the design/improvement introductory statistics at Carnegie Mellon. References for this include the department's teaching heads are Professor Rebecca Nugent (rnugent@stat.cmu.edu) and Professor Howard Seltman (hseltman@cmu.edu).

What are the most relevant learning points for my audience? At the risk of stating the obvious, each class should have specific learning objectives for the student audience and the place in their curricula, in their respective majors. This always requires a survey of students' concentrations and their progression into their curricula. Without exception, this is worth spending substantial time surveying, and very early in the semester. Within the larger framework of the original intended structure of the class (i.e. pre-defined set of topics that need to be covered), the knowledge of students' objectives largely defines the finer details; should I present more proofs or more applications? Should I go into computation or not? Which sub-topics will be important (and which ones are not necessary?) How much mathematical notation or detail can I use without defining? Should I hold recitations or extra homework problems that teach them? In designing a course, these important questions are only answered well when the instructor knows the composition/background of the audience.

Two important points in teaching methodology The general learning objectives in a statistics class directly informs the *methodological* tools for teaching. The objectives (from the teacher's perspective) would be twofold (1) organize and teach each technique / concept precisely in some well-planned order, each with one or two good applications or motivating examples, and (2) constantly remind how the high level concepts connect to each other. The former point may be self-evident but still worth mentioning, since when one concept is lost, all 'children' concepts are subsequently lost. It helps to think of this in context of an actual lecture in action. When a concept (say, defining a certain probability distribution) is not well transmitted in lecture, the students tend to lose focus thereon and fail to register all subsequent, related concepts in that lectures.

As for the latter objective, a statistics class is inherently technical; most concepts/tools are mathematical formulations of a real-world phenomomena, with terminology and notation that can become sometimes esoteric to newcomers. This is more important than memorizing each concept, whose mode of learning doesn't allow for long-term recall. Indeed, in a technical field, a *network* of concepts whose map is retrace-able is much more reliable for recalling information than rote memorization of formulas.

Attention to detail is key. From my experience in two classes, I feel attention to detail often makes or breaks an effective learning experience.

I feel rehearsing each lecture *immediately* enhances the quality of teaching. In my case only, this is related to how I organize my academic presentations (talks), where I'm much more comfortable

delivering a technical message when I have written down and rehearsed most talking points (and potential questions). The alternative is to improvise or near-improvise. In my experience, improvising often leads to downright failures to deliver coherent explanations, and wrong statements that later need correction. Errors delivered in lecture (albeit with correction afterwards) is detrimental in the class setting where knowledge is delivery rather than discourse; in a discourse, these mistakes don't survive.) How much to rehearse? I feel the gold standard is a *full* rehearsal word-by-word, and anything in between this and a abridged rehearsal of major talking points, helps.

An important part of the class experience is trust and respect for the instructor. Building this takes considerable attention to detail, in two ways. (1) First, the instructor or teaching assistant should be available at a wide range of times; the instructor needs to continually ask for feedback and questions, and should encourage students' questions during lecture and office hours. This sends the message that the instructors actually care that students succeed in the class. (2) Secondly, the posted class material should have no errors, and should be immediately addressed/corrected, so that lecture notes and homework solutions can serve as a reliable 'gold standard', also setting a bar for how (little) 'sloppiness' or 'wiggle room' the instructors are willing to allow in the class experience (to and from the students).

I am also a big fan of extra credit problems, but not in the conventional way. I don't feel like such problems should be be of a full-step higher difficulty than regular questions; they can be at most 10-20 percent harder than the regular questions, but should mostly have equivalent difficulty as any other nearby problem, so that they are simply 'additional practice' questions. The idea is to make the students do a bit of work for extra credit, which will encourage them to do more – creating this virtuous loop – while limiting the possibility for the *stoppage* of this loop with excessively difficult extra credit problems – which will only discourage them from making subsequent attempts. This clearly involves fine-tuning by the instructor.

Epilogue: a Random Rant. I will continue to polish and add to the statement. I don't feel that a teaching statement needs to adhere to the usual dos and don'ts you can find online about writing such statements. I simply don't see why it is necessary. The reader is probably not an employer who selects two stellar hires from a stack of 3,000 papers (which well justifies the limit of a resume to 1 page). It is more likely 1 in a stack of tens. So instead, I (clearly) feel a teaching statement can/should be longer and fuller in content. In my case, it is a collection of lessons and philosophies about teaching, coming from experience. I'd be happy to summarize/discuss more specifics about each point above and many others that were left out for a possibly misplaced purpose of brevity.

I read in a book (either in "The last lecture" by Randy Pausch, or "Shop class as soulcraft" by Matthew Crawford) that teaching a class is less like selling a product to a customer, and more like a health trainer – you can't make the audience happy without making them a bit miserable. I would only add that the trainer also has an undeniable responsibility to be well prepared and to take his clients' goals and needs seriously.