Teaching Philosophy

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This document records my current thoughts on teaching optimization and analytics. I am still relatively early in my teaching career, and my views continue to evolve through practice, reflection, and learning from others. My experiences with undergraduate, master's, MBA, and PhD students have shaped the thoughts below.

1 Major influences

Three people have been especially influential in shaping how I think about learning and teaching.

- **Richard Feynman.** As an undergraduate, I studied *The Feynman Lectures on Physics* carefully throughout my physics coursework and was deeply inspired by the intuition and beauty of its explanations. Later, reading biographies of Feynman and writings on his approach to understanding and teaching deepened that influence. The principle I take from his approach is that if I cannot explain an idea to someone with no technical background, I have not yet truly understood it. I think of this as a four-step process: choose a concept; explain it as if teaching a child, without technical jargon; identify gaps in my understanding and revisit the material to resolve them; and simplify the explanation until a child could follow the essential idea.
- **Robert Freund.** Rob has strongly influenced how I think about preparing and presenting a lecture. From him, I have learned the value of high-quality slides and of using data and visualization to make a complicated problem concrete. I especially appreciate how he guides students through a difficult concept step by step, breaking it into simpler ideas that build on one another. His approach has shaped how I think about making technical material accessible.
- **Alexandre Jacquillat.** Alex's approach to managing large classes and large teams of teaching assistants has been especially influential for me. I have also learned from him how to prepare effective slide decks efficiently. His passion in the classroom has made a strong impression on me and influenced how I think about sharing my enthusiasm for a subject with students.

2 What I find rewarding about teaching

I am passionate about teaching because it gives me an opportunity to share my understanding, passion and experience with students. Three aspects of teaching are especially rewarding to me.

- **Sharing my understanding.** I enjoy developing my own understanding of a subject and finding a clear way to communicate it. Teaching gives me a chance to share both the ideas themselves and what I find interesting about them. I hope students can feel my enthusiasm for the material and develop an interest of their own.
- **Seeing students learn.** It is deeply rewarding when students tell me that they have learned a great deal from a course. Some have described my course as one in which they learned the most during their studies. Knowing that an explanation helped a student understand something that had seemed difficult gives me a strong sense of accomplishment.

- **Opening new possibilities.** Some MBA students who entered my classroom with little background in data analysis have gone on to pursue data-related careers after taking my course. Seeing teaching influence a student's interests and career direction is especially meaningful to me. I hope that the understanding and experience I share will continue to be useful beyond the classroom.

I have received strong teaching evaluations, particularly at Chicago, as well as encouraging feedback at MIT. The most meaningful reward, however, is seeing students carry what they have learned into their own thinking and work.

3 Past teaching experience

- **University of Chicago.** At the University of Chicago Booth School of Business, I taught the MBA course *Data Analysis with R and Python* and the PhD course *Modern Large-Scale Optimization: Theory and Computation*. I substantially revised the existing MBA course materials to modernize the content and designed the PhD course from scratch around the optimization ideas I considered essential for doctoral students. I especially enjoyed the freedom to organize these courses around my own understanding and share it with students. Much of my teaching philosophy took shape through this experience.
- **MIT.** At MIT, I have taught *Optimization*, a common-ground course in School of Computing for undergraduates and master students, and the MBA course *The Analytics Edge*. Both were already well developed when I joined, and teaching these large courses has involved working closely with other faculty. I converted *The Analytics Edge* from R to Python to keep the course aligned with changing practice. I also developed a new MBA case study based on my experience working with eBay, turning an application experience into material that students could learn from.

4 What I hope students take away in the AI era

Thinking about teaching in the AI era has made me distinguish more carefully between obtaining an answer and developing one's own understanding. When students use AI for explanations or code, I want them to be able to reason through what they receive and judge how it applies to their problem. Knowledge remains important. Three aims guide my teaching.

- **Understanding.** I hope students learn how to think about a subject: how to identify its essential ideas, uncover the logic connecting them, and break a complicated problem into simpler parts. In optimization and analytics, this means connecting technical details to the underlying ideas and being able to explain the reasoning in their own words. I want students to develop this way of thinking as they learn the course material.
- **Taste and beauty.** I hope students, particularly doctoral students, develop an appreciation for what makes an algorithm elegant or insightful. There is an artistic aspect to optimization that I find deeply appealing. I want students to experience some of that beauty and begin to form their own taste for ideas and explanations.
- **Usefulness.** Operations research has a strong connection to applications. I want to share my experiences using OR in practice, including when and how a method works and where its limitations lie. I also hope students understand how to apply these techniques in their future work to help their organizations solve problems and make better decisions.

5 How I approach teaching

The following principles guide how I put these goals into practice.

- **Develop my own understanding first.** I use a simple test: can I explain the essential logic of an idea in plain language to my wife, who has a background in business? Preparing to teach means working through the material until I can give a clear, concise explanation.
- **Make the logic easy to follow.** I organize explanations around a central idea and a few supporting points, following the pyramid principle. I simplify terminology and notation so that students can follow the reasoning, especially when they have limited technical backgrounds. I want slides to make that reasoning easier to see.
- **Prepare my wording carefully.** As a non-native English speaker, I sometimes need time to find the right words for explaining an idea. I am working to improve this through extra preparation.
- **Connect ideas with practice.** I draw on my application experience to explain why the material matters and how it can be used. I also revisit course tools and examples to keep them relevant to students' learning and subsequent work.

6 What I am learning through co-teaching

Co-teaching at MIT has taught me to work within a shared curriculum. My understandings and explanations sometimes differ from a textbook's presentation or from how a colleague would explain a topic. I am learning how to contribute my own understanding while helping students have a coherent learning experience.

- **Find common ground.** I am learning to discuss differences in interpretation and teaching style with colleagues, beginning with what we want students to learn. Agreeing on these goals helps us decide how to present the material and how the parts of the course should fit together.
- **Communicate within shared materials.** I continue to work on conveying the logic I find important through the slides and structure of an established course. This requires flexibility in how I express an idea and attention to how my explanation connects with the rest of the course.
- **Accept compromise as part of teaching together.** I am learning to be flexible about my preferred explanations and ways of organizing the material. A shared course requires choices that take account of different instructors' approaches and the course as a whole. My commitment to understanding and clarity remains, and I want students to be able to follow the reasoning across the course even when different instructors explain it in different ways.