TEACHING STATEMENT

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When the pandemic started, I was on sabbatical. So I didn't need to dramatically change the way I taught overnight, thank heavens. Moreover, unlike many of my peers, I already had a large library of recorded lectures because I've been doing a flipped classroom for a decade (below is my very first lecture from 2013). Nevertheless, I still had to change the way I taught. Let me tell you how and why it took me so long to realize it.

1. Flipped Classroom

If you haven't heard the term before, a flipped classroom is where you record the lectures, students watch them before class, and then you use the normal class time to answer questions, work through exercises, or to talk about tricky issues on homeworks. Following the suggestions of Zappe et al. [2], I keep my videos short (around 30 minutes total, edited for concision and broken into 5–15 minute chunks).

For example, when I talk about topic models, I have videos where I:

(1) discuss with an interlocutor why topic modeling is important
(2) introduce what topic modeling is;
(3) walk through Gibbs sampling to fit a topic model from text data;
(4) discuss variational inference in general; and
(5) then walk through the derivation of variational inference for topic models.

The technical quality of the videos have improved considerably over the years: I've moved from just a screen capture to a multiple camera setup with green screen.

Then in class, I answer any questions students have and then we go through an exercise. For instance, we walk through Gibbs sampling works for a toy example. Students calculate—by hand—the sampling equation and go through the process to get the answer.

1.1. **Building Bonds.**

There's research to suggest that the flipped classroom can help students engage and retain information [3], but that's not the real reason that I do it. I do it because it helps me get to know the students better. Computer science is the biggest major at Maryland (over three thousand undergrads), and AI-adjacent fields are even more popular within that major, so my classes are getting pretty darn big. If I didn't do a flipped classroom, I would know so many fewer students.

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And the flipped classroom also helps form bonds between students. When I was an undergrad, I wanted to take organic chemistry even though I was a history / cs major. That failed because studying for that class was pretty social, and I was not a chemistry major, so I didn't have an existing support network coming in. Now that I'm a professor, one of the reasons I like the flipped classroom is that it forces people to talk to each other to figure out what questions they want to ask, work together to solve practice problems, etc. Those groups and those connections often carry over to homework groups and project groups.

And this helps me serve the few iSchool, Linguistics, and other "oddball" students who are exploring something unfamiliar and—like 2003 Jordan trying out organic chemistry—don't have an established buddy group (which many of the CS students have). The flipped classroom helps them get to know the people who can help them survive and thrive in the course.

When I once I fell off the wagon and went back to a "normal" lecture mode in 2016 because it was my first time teaching a class, it had a hundred people, and I had no TA. I was told that students coming in would know Python. But it turned out that a big contingent had only played around with the language for a week or two and were unprepared! Because I didn't flip the classroom, I only found out when they were turning in the first homework! This wouldn't have happened in a flipped classroom where I could see that the struggle was real in front of my own eyes.

So back to March 2020. To make sure that I did not miss out on creating educational content, I started creating a weekly pub quiz to replace quiz canceled by our usual haunt, closed of course by the pandemic. And as the pandemic dragged on and on, I learned how to create interactive, fun environments that got small groups to discuss problems, come to a solution, and then share it with the group—the same thing that I'd need to move the interactive portion of flipped classes online. And I learned how to broadcast with a green screen in real-time and share multimedia with the group. (All outlined in this document that formed the foundation for pandemic-era pub quizzes.) I used the same format and technology for Google's Efficient QA competition that I hosted in December 2020.

2. Hybrid Classrooms

Given all of this, I thought that when we (mostly) returned into hybrid classrooms (i.e., some students in the classroom some were on Zoom), I'd be all set for the new world of teaching. After all, I had already mastered asynchronous videos, and I had practiced online-only interactions. I was not ready, however. In a real classroom, I could tell when a student was lost or disengaged. This is not true when many students are on Zoom. A hybrid classroom has a particularly pernicious failure mode: a student doesn't watch the videos, joins online, gets lost in the discussion, and then silently disengages.

To make matters worse, many of the improved learning outcomes in flipped classrooms come from regular quizzes [1], which if nothing else would have diagnosed students disengaging. In an attempt to make classroom management easier and to lighten the burden on students, I suspended quizzes. Another mistake!

And this isn't transitory. Although it emerged under unpleasant circumstances, I think the hybrid classroom is going to be with us for a while for good reasons. Even after we returned to classrooms, students were struggling with visa issues, health issues beyond COVID, were attending conferences, were at home for a wedding, or were snowed in. It makes the classroom more equitable and flexible.

And like many faculty, I'm still developing best practice on how to do this. I encourage people to keep their cameras on and I make a big deal of the 10% participation grade. This creates some annoyances…for example, students asking questions for the sake of hitting the participation quota rather than actually wanting information,

but it's a small price to pay. I'm proud that after a shaky start and uncooperative AV, I'm getting good engagement from both in-person and Zoom students.

3. Assignments

But teaching is not just about lectures. My courses typically have a few small, practical assignments (typically three to five), a midterm, and a course project.

The assignments give continuity to the class and allow students to practice skills introduced in the class; I encourage students to work together to solve homework problems. For example, students put together a logistic regression classifier to determine if an answer to a question is correct or not. In my mind, an ideal homework assignment has an easy to achieve initial goal but leaves room for exploration. Returning to the logistic regression example, just implementing stochastic gradient descent challenges some students (and they stop there), but for students who want to explore further, they can try out different step sizes and updating schedules for extra credit.

The midterm serves as a reality check for both my students and me. I design exams with five to six free response questions (of which students must answer a subset) that synthesize disparate concepts from the course in a problem context (e.g., for a machine learning course, proving the VC complexity of a simple hypothesis class). Based on the results of the midterm, I can identify students that might need extra help or what areas I need to cover in more detail.

4. Projects

I want to make sure that my students can actually use their skills once they're done with the class. Thus, I typically end courses with a project. It reinforces key concepts from the course, connects those concepts to the rest of their curriculum and research, and often serves as a launching point to things that are useful in the real world. For undergraduate classes, this is more directed: in one class they build trivia-playing robots to take on former *Jeopardy!* Champions or Victoria Groce from the American version of *The Chase*.[1] For graduate courses, projects are more open-ended. Projects in my courses have become a comedy troupe's website, have unearthed previously unknown primary sources on local history, helped students advance in the workplace, and resulted in academic publications. As a testament to the effectiveness of these relationships, after one graduate course I taught (Computational Linguistics II, UMD CMSC 773), I ended up publishing papers with four of the eight students.

5. Outreach

And I like to think that my teaching style has helped learners outside the University of Maryland make progress toward learning about the interaction between science and society. The videos on my YouTube channel have been viewed a million times and my most popular videos about fifty thousand times. This has offered me new connections: e.g., people who come up to me at conferences to say that they learned variational inference or TV producers wanting to make a Human vs. Computer game show.

A major part of my research is making machine learning accessible to high school students. My human-computer question answering exhibition matches have attracted thousands of interested high school students in DC, Chicago, Dallas, Atlanta, and Seattle. I've also served as a mentor as a part of Maryland's Bitcamp and Technica hackathon programs on projects of women and underrepresented minorities to build QA systems.

Thus, I'm glad that I had to up my game because of the pandemic, starting with an *ad hoc* trivia game in mid March 2020. I think it's a good example of how with technology we can better serve those who want to learn, whether they're our students or not. And while some innovations are a matter of necessity rather than of careful deliberation and insight, we should still embrace them if they help students learn better.

[1] https://www.youtube.com/watch?v=dyaR7zT_KKg

6. Mentoring

6.1. **Mentoring Undergraduates.** Like everything else, the pandemic has changed the way I work with undergraduate researchers. I began a "anyone welcome" summer virtual internship for undergraduate students to work on small, bite-sized projects that fit into a larger research program (usually directed by a mid-career grad student). Our work with undergraduates has been published in top venues like NAACL and CHI, and the undergraduates I've worked with have gone on to have successful research careers (e.g., Lester Mackey became faculty at Stanford before moving to Microsoft Research, Eric Wallace is now a PhD student at Berkeley). My current star undergraduate student, Chenglei Si (class of 2024) already has six publications in top venues.

6.2. **Mentoring Graduate Students.** I've graduated seventeen PhD students and am the chair or co-chair for eight current students. I like to have a group meeting every other week with students I'm working with (broadly construed), and one-on-one meetings as needed with students, typically once a week. In addition, everyone in my group (me included) sends a weekly e-mail to the group saying: what they worked on that week; what they plan to work on next week; anything that's holding them up or blocking their progress. I use an Internet chat program (Slack) to communicate with remote students and for lower-latency conversations than e-mail.

In their first year, students typically work on a starter project that builds on a senior student's work; this often becomes a paper with the new student as a first author. From there, I work with the student to craft a trajectory of papers that will form a foundation for the rest of their graduate studies.

After graduation, my students have gone on to good positions in industry (e.g., Forough Poursabzi and Ahmed Elgohary at Microsoft Research; Pedro Rodriguez at FAIR) and academia (e.g., Alvin Grissom II, Assistant Professor at Haverford; He He, Assistant Professor at NYU; Mohit Iyyer, Assistant Professor at UMass Amherst).

7. Example Sylabuses

Part of my commitment to public education is to ensure that all of my course materials (lectures, syllabus, assignments) are publicly accessible. The most recent version of each of my courses is listed at http://users.umiacs.umd.edu/~jbg/static/courses.html. My video lectures are available on YouTube at https://www.youtube.com/c/JordanBoydGraber/videos.

References

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