Teaching Statement

Brian Plancher
brian.plancher@gmail.com

Through my time in business and academia I have come to realize that while it was important to learn all of the facts presented in a given course, the most valuable skills I learned in the classroom were the problem solving methodologies and soft skills I could reapply to any future endeavor. I have also come to realize that all students and colleagues enter new courses and jobs with different backgrounds, expectations, understandings, preparations, and life contexts. As such, my goal as a teacher is to ensure that my classes are skills based, foundational, and accessible.

Skills based

In the United States less than 30% of the population will attain a graduate degree and less than 50% of STEM doctorate degree holders will continue on to a career in academia [1, 2]. Inspired by this fact, my professional experiences, and my interdisciplinary academic research interests, I aim to teach courses that not only teach the core course material but also skills that students can use in the future. My goal is that students will leave my courses understanding how the course fits into the broader engineering/computer science curriculum and how the tools learned in the course can be applied to problems they will face in both their future academic and professional careers. This goal informs my lectures and assignments.

For example, when structuring the robotic motion planning lectures I give to the introductory artificial intelligence undergraduate class, I make sure to not only describe the various algorithms both mathematically and pictorially, but to also spend time discussing the trade-offs in using each algorithm. I then ask problem set and exam questions that are open ended, engaging the students to decide when and why a particular class of algorithms would be useful. When grading these questions I find that I constantly have to revise the grading rubric to include new creative solutions.

As another example, I co-designed an interdisciplinary graduate seminar bringing together roboticists and computer architects. As part of the course, each student was expected to present a summary of a paper from a curated list. I adapted the assignment to include presenting one thing the students liked and disliked about the way the paper was written / structured. Through this exercise, the class effectively crowdsourced a paper writing guide for their use in the rest of graduate school.

Foundational

Whether teaching an introductory undergraduate course or an advanced graduate seminar, my goal is that the students will leave with a foundational understanding of the topics covered in the course. In that way students will be able to build on that foundation in future courses or in their research.

In introductory courses this manifests itself in a focus on teaching the concepts upon which the discipline (or sub-discipline) is based. For example, in the introductory artificial intelligence class, I always try to structure my lectures and sections around teaching the concepts behind algorithms in

general, using the particular artificial intelligence algorithms as examples. My goal is that students come away understanding the concepts of recursion, local approximation, complexity analysis, etc., and not simply knowing how to write down the value iteration equation.

In advanced undergraduate and graduate level courses the level of detail is increased but the concepts stay the same. By carefully choosing papers to be read and analyzed in seminar style courses and by asking probing questions during group discussion, the foundational themes of the specific sub-field can be reinforced in every class. For example, in a graduate course on robot motion planning I gave an example paper presentation using one of my published papers where I focused on the differences and tradeoffs between gradient descent, Newton's method, and our method, leading to a discussion of where, when, and why the various optimization approaches should be applied.

Accessible

By teaching with a focus on foundational and skills based learning, my hope is that students are able to build a toolkit they can use to be successful in their future course of study and in whatever career they choose to enter. However, in order to ensure that all students are able to build that toolkit, it is important to structure courses and teach in a way that is accessible to all of the students in the class, across their diverse range of backgrounds.

One way I have tried to address this issue is to focus on ensuring that students see the same topic through different lenses of learning. For example, in the intro artificial intelligence class I used multiple teaching tactics including:

1. Deriving the algorithm
2. Providing a graphical explanation of the algorithm
3. Connecting, comparing, and contrasting that algorithm to other algorithms learned in the class (and from previous required courses if applicable)
4. Showing a video of an algorithm in action in the real world
5. Assigning theoretical questions about the algorithms properties in problem sets
6. Assigning a coding assignment to code up the algorithm

By using these multiple approaches, students who are visual, mathematical, and/or experiential learners get exposure to the topic in the way they learn best.

At the same time I strive to create an inclusive environment in the course and make my office hours a safe space to ask any question. I also try to ensure that office hours are available to all students by spreading out the office hours of the teaching staff across different days and times, and then offering additional times by appointment. I include a diversity, inclusion, and belonging (DIB) statement on the syllabus that explicitly calls out the fact that the course staff may have blind spots and that science has historically been dominated by white males. I work with the course staff to actively try to address these issues and encourage the students to support the course staff in this effort. Finally, I am committed to 360° feedback and ask for anonymous student feedback after every lecture to improve the course in realtime.

References

[1] US Census Bureau. Number of People With Master's and Doctoral Degrees Doubles Since 2000.

[2] National Science Foundation. Table 12-1 - NCSES Survey of Doctorate Recipient: Fall 2017.