ERIC C. LARSON | TEACHING STATEMENT

My main motivation for staying in academia is the opportunity to teach and mentor. I believe teaching encapsulates development of critical thought, reasoning, and, of course, a knowledge base—the ability to share a role in this development has always been a rewarding and fulfilling experience for me. I take great pride in this role and look forward to fostering it alongside my role as a researcher and mentor.

PEDAGOGICAL PHILOSOPHY

The development of my pedagogical beliefs is as much a factor of my teaching experience as it is a factor of my experience as a student. I believe teaching is a practical case of multi-objective optimization, with core principles constantly in competition with one another. The goal of teaching is to optimize each objective in a way that captures the tradeoffs in each approach, never allowing one philosophy to dominate.

Open-ended Problem Solving. Having a question with no concrete answer is one of the best ways I have found to foster creativity and original thought. It forces students to think outside of the box, and, in this day when Google might be the first resource, it might even land a few more students in office hours. It is also a great tool for encouraging participation in class. For instance, I often intentionally question what I just wrote, "*Is that right?*" or "*Is there any situation where this might not apply?*" which tends to get discussions started. The caveat here is not to overstrain the learning environment, where too many open-ended problems muddle the core concepts.

Real Applications and Practical Examples. Everyone struggles with different concepts—many times they are so caught up in the theory that the utility of the concept is lost. Guiding students through a practical application of the concept can make it more concrete while also showing proper analysis techniques. *But*, this can also shut down creative thought, making every related problem follow a prototype. As teachers, we must be aware that knowing what particular concepts a student will need in their career is impossible, and keeping the concepts outside of a prototype may help the student apply a concept abstractly.

No Two Students are the Same. As an example, it is important to know the difference between an undergraduate student and a student returning to school from the workforce. An undergraduate student often times does not know what concepts they will need in their career. They not only need a breadth of knowledge and choices presented, but also repeated chances to develop secondary skills like debugging and team building. A returning student is often more tailored and set in their interests, and they appreciate a structured opinion that is specific to their expertise.

Passion and Humor. My two-year-old son can pay attention for about fifteen minutes. In my experience, this also applies to graduate and undergraduate students. I have found that enthusiasm and a well-timed anecdote helps everyone focus and recharge. Lecturing can be entertaining and personable—something I have found to be appreciated when introducing new concepts. The caveat here is to lose control of the core outline and rush through required curriculum later. Sometimes its best to muscle through, something always appreciated the lecture before an exam, for example.

Conceptual Mapping. I begin my lectures with a concept map of the curriculum. One of the most frustrating experiences as a student is *not knowing how subject matter connects* or *when one topic feeds into another*. For instance, the Laplace transform may not pique the interest of all the students, but understanding how it influences controls, networks, and audio processing is enough to motivate its importance. The danger in using concept maps is stifling creativity or underselling a particular concept. For instance, "*this concept doesn't connect to much else, I am probably okay to let it slide*." In these scenarios, most often seen in graduate courses, I try to stress that the roadmap is incomplete and future research may open the door for a particular concept in areas we have not yet thought up.

My teaching experiences have helped me to recognize these tradeoffs in each teaching principle and employ each principle in a realistic, structured way. This includes my experience teaching classes, as well as mentoring students just starting their research studies.

EXPERIENCE

My teaching experience began at the end of my sophomore year at Oklahoma State University, when I became a teaching assistant for network analysis. I introduced and guided students through lab experiments, and taught an introduction to Matlab programming and circuit simulation. Working with first and second year students in a hands-on course helped me realize the utility of practical applications and concept reinforcement with open-ended problems. The fulfillment that teaching brought to me over those two years solidified my decision that, whatever my future career held, **I wanted teaching to be a major component**.

Since then, I have held several teaching assistant positions—at Oklahoma State University and the University of Washington. I have graded, designed coursework (including final projects and exams), and planned and given lectures. I was nominated every year for outstanding teaching assistant and received several perfect evaluations. From students, I have received evaluations such as "*Let Eric teach the class, I feel like he taught me every concept*" from an undergraduate class and "*Eric is the best TA I have ever had, period*" from a graduate class in signal processing. From my peers I have received formal evaluations stating, "*Eric has a real command of the classroom—impressive.*"

I have redesigned course material on two occasions for courses that I would not be teaching—the first in Digital Logic Design and the second more recently teaching signal processing to computer scientists. On the most recent occasion we redesigned the textbook for the class to introduce DSP topics without reliance on physics (*i.e.*, similar to a "DSP First" approach, except relying more on intuition about certain phenomena). I found this to be a challenging task, but ultimately beneficial and eye opening. It was a more student centric approach and helped me place the context of the course inside the goals of the department—something I have come to appreciate.

I have also found that teaching is as much a part of research as it is the classroom—something that I have gained experience with over the last four years. I currently manage the undergraduate recruitment and independent study in my research lab and have also taken major roles in mentoring junior PhD students and master's students. I have mentored several undergraduate students into both the industrial job market and into graduate programs—two of these undergraduates first authored accepted papers [1,2]. In my experience, laying out choices for students and explaining ramifications is a vital first step. Once a student decides on a particular career path, it is the mentor's job to not only point out what strengths give the student an advantage, but also point out any potential weaknesses that would hold back the student from attaining their goal. I place great time and effort into giving the right criticism—even if that means sending the student to someone who can provide a different perspective. This reiterates one of my core teaching principles—**no two students are the same**.

FUTURE PLANS

Based on my experience, I would feel prepared teaching a number of classes at the undergraduate and graduate level—as well as taking a role in redesigning and adjusting courses so that the curriculum is consistent with prerequisites. I would have no trouble lecturing classes in continuous and discrete signal processing, controls, image processing and computer vision, ubiquitous computing, general machine learning and various special topics in machine learning, optimization techniques and theory, and evolutionary computation. I could also teach a number of core classes in engineering and computer science, such as introduction to electrical engineering, basic programming, data structures, technical HCI, and introduction to embedded programming.

I would be interested in teaching a number of special topics in sustainability and health as they apply to computing. I would also be interested in developing a "signals interpretation" class dedicated to proper use of signal processing techniques for time series analysis (*i.e.*, spectrograms, linear prediction, cepstra, and other transforms). I would also be interested in introducing topics in machine learning to students outside engineering, and developing a graduate course on semi-supervised machine learning. I ultimately want to reduce the barriers for understanding topics in computer science and engineering, especially in signal processing and machine learning, but more than that, I want to create an environment where students know the broader impacts and applications of the theory.

BIBLIOGRAPHY

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