Teaching Statement

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Profoundly shaped by the dedication and expertise of several remarkable teachers and mentors, my own educational journey have led me to the firm belief that good teaching can change a student's life trajectory. Over the years, I have been thinking and reflecting on the quintessential pedagogy that balances the act of engaging, conveying, and inspiring. Specifically when crafting my course materials, I have always been guided by a series of introspective questions[1] aimed at ensuring that they are not only informative but also thought-provoking. These practices led to my teaching philosophy formulated around the effective use of visualization.

Teaching Philosophy

Visualization is central to my instructional approach, underpinned by its alignment with human brain's remarkable capability of rapid image processing, reportedly outpacing text by a factor of 60,000[2]. This capability enables students to extract information from visual aids alongside verbal explanations far more efficiently than text alone, allowing for profound engagement in class. In the realm of STEM education, where abstract theories and complex equations can be daunting, visualization serves as a vital bridge, translating intricate ideas into comprehensible and memorable images. It also elegantly addresses the pedagogical challenge of conveying essential concepts without resorting to simply reading from the slides—a practice that hinders critical thinking. Beyond the immediate classroom benefits, the ability to visualize data and concepts is an indispensable skill for students, one that is increasingly critical in both their academic pursuits and future research careers. Building on this philosophy, I address the challenge of ensuring consistent takeaways from the course materials in different learning experiences—whether inside or outside the classroom—by integrating concise bullet points alongside visuals, ensuring key messages being conveyed.

Pitfalls and Lessons Learned

Designing visuals that effectively encode information demands thoughtful consideration and attention to detail, ensuring accessibility for all learners. Drawing from personal experience with minor color vision deficiency, I am acutely aware of the importance of not relying solely on color contrast to convey information. A counter example in Fig. 1, where color is the only differentiator between the two spectra, renders the information hard to interpret for those with color vision impairments. The prevalence of color blindness, affecting approximately 8% of males and 0.5% of females[3], might surprise many. However, this statistic virtually guarantees that in any moderately sized classroom, at least one individual is likely to have some form of color vision deficiency. In recognition of this, I am committed to employing multiple modes of differentiation in my teaching materials, such as patterns, textures, and annotations, to ensure that all students, regardless of visual ability, have equal access to the information presented.

[1] The five questions I ask myself:

1. What will students take away while actively engaging with both my spoken words and the slide content?

2. What will students take away while independently examining the slide content at my lecture pace?

3. What will students take away while reviewing the slides outside the classroom?

4. How do I ensure that the key takeaways are consistent across these varied learning experiences?

5. How do I structure the slide content that conveys the key messages without directly reading off the slides?

[2] Humans Process Visual Data Better, `https://www.t-sciences.com/news/humans-process-visual-data-better`
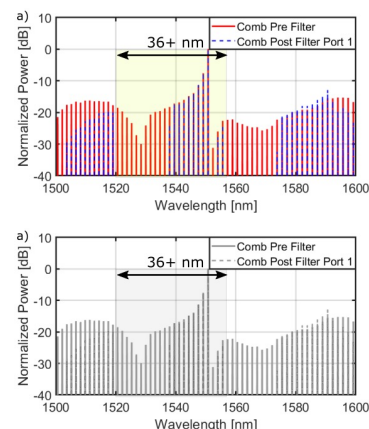

Figure 1: Example of non-robust information encoding solely with color contrast. Top: two spectra distinguishable by people with normal color vision. Bottom: illustrative rendering of the same two spectra possibly perceived by people with color vision deficiency.

[3] Types of Color Blindness, `https://www.colourblindawareness.org/colour-blindness/types-of-colour-blindness/`

Inclusive Teaching

Extending beyond color vision awareness, my commitment to inclusivity encompasses all aspects of diversity and accessibility in teaching. I recognize that students come with a broad spectrum of cultural backgrounds, personal experiences, and family education history, all of which impact their learning needs. In light of this, I will strive to create a classroom environment that is not only physically accessible but also cognitively and culturally welcoming. This involves the use of language that is inclusive and bias-free, as well as the incorporation of diverse examples in my teaching materials, for both of which I will conduct regular reflections to ensure compliance.

Teaching Plans

Aligned with the esteemed curriculum of the Department of Electrical and Computer Engineering at the Duke University, I am eager to contribute by teaching a range of courses that intersect with my expertise, such as Computer Architecture (ECE 250D), CMOS VLSI Design Methodologies (ECE 539), and Optics and Photonics (ECE 340L). Believing that the preparation for teaching materials deepens my own understanding of the subject matter, I am also open to teaching courses outside my expertise, such as Computer Network Architecture (ECE 356). Moreover, I am enthusiastic about the prospect of designing new courses, currently not offered at the Duke University, such as Electronic Photonic Design Automation and Integrated Silicon Photonics, which could expand and enrich the department's already distinguished curriculum[4].

[4] Courses that I am interested in teaching/developing at the Department of Electrical and Computer Engineering:

1. ECE 250D Computer Architecture
2. ECE 539 CMOS VLSI Design Methodologies
3. ECE 340L Optics and Photonics
4. ECE 356 Computer Network Architecture
5. Electronic Photonic Design Automation
6. Integrated Silicon Photonics

Mentoring

My mentoring philosophy extends beyond sharing knowledge and offering intellectual advices. I am dedicated to providing holistic support for the academic and professional development of the students. I aim to create a supportive and collaborative research environment, inspiring students to excel in their studies, uphold professionalism, and explore their own research interests until they emerge as independent researchers. My time as a postdoc at Columbia allowed me to partially implement this philosophy, guiding several Ph.D. students to significant milestones, including publishing their first papers as lead authors at premier conferences like OFC and CLEO, and securing their initial industry positions. I eagerly anticipate the opportunity to extend and refine my mentorship practices at the Duke University.

Post–COVID-19 Considerations

In the post–COVID-19 era, I have adapted to the new normal of hybrid teaching and research settings. I am prepared to refine my teaching and mentoring approaches to accommodate the new challenges. For example, I plan to equip my slides with more annotations and necessary animations, compensating for the absence of real-time interactions in front of a physical whiteboard. Additionally, I plan to introduce regular coffee hours and/or lunch meetings within the group to facilitate in-person discussion whenever feasible and in compliance with the university guidelines. Such adaptability is critical for navigating through the evolving educational landscape, and I am committed to the continuous innovation in my teaching and mentoring practices to provide all students with accessible and effective education.