Teaching Statement

I believe teaching is the most influential activity we partake in. Having learned from patient, empathetic, and talented teachers, I want to help the next generation of students learn about civil engineering and operations research similarly. The overarching theme of my teaching is helping students learn how to learn. I have five major goals for student learning: teach how to analyze the problem at hand rationally and make reasonable assumptions, teach how to find the proper resources to tackle said problem, collaborate with and learn from peers and experts from other disciplines, try out novel approaches and be okay with things not always working out, and lastly, keep an open mind and a desire to keep learning and innovating.

Engineering courses deal with the mathematical formulations and methods to solve them. Usually, little time is spent on connecting the numbers to real-life scenarios. As a teaching assistant, I saw that students knew different probability distributions, but struggled to choose the right distribution when given a word problem. My teaching pedagogy will involve helping students analyze real-world situations and then translate the components to corresponding engineering concepts. For instance, rather than asking "Calculate the probability of no arrivals in 5 min for a Poisson process with rate λ", a more appropriate question would be, "If a coffee shop has λ new customers per minute on average, what is the probability that no customer shows up for 5 minutes?" I will assess this skill by designing the assignments, exams, and projects as practical problems rather than abstract math problems, and evaluating student argumentation to ensure learning[1].

My second goal for student learning deals with knowledge of available resources. As engineers, we have established construction codes, legal practices, and manuals for ready reference, and these resources are easily available. However, experience and training help identify appropriate resources and venues to access said resources. While mentoring GLUE[2] undergraduates, their ramp-up involved me guiding them in accessing research papers, judging relevance and importance, and learning tools for experimental work. Post ramp-up, they built on it rapidly, harnessing prior knowledge and creativity to generate results quickly. One student contributed to a peer-reviewed publication[3], and another in TxDOT proposal writing. I will teach this using smart course project design and by requiring verified sources. Depending on the course, I will use a subset of reading responses, programming sessions, software and data-based assignments, or traditional assignments and exams to assess student learning.

My third goal focuses on collaboration and knowledge exchange. Engineers collaborate with peers and interface with non-engineers to exchange project information and discuss impact. From personal experience as a traffic consultant to Westlake Hills city[4], presenting ideas in a town hall setting is very different from presenting in any academic setting. Using differences as learning opportunities and allowing my students to maintain an open mind towards different worldviews is crucial towards achieving this goal. I will inculcate this by including collaborative discussion activities in class as well as group work for miniature real-world projects. Specifically, I want to stress equal opportunity, service-based projects, language sensitivity, and inclusive curriculum. Working with various socio-economic stakeholders can

[1] Andrews, M. E., & Patil, P.N. (2021). "A Systematic Review of Argument Assessment Frameworks in Engineering Education." In ASEE Annual Conference & Exposition Proceedings, 2021.

[2] Graduates Linked with Undergraduates in Engineering research program, one semester long

[3] Patil, P.N., Ross, K.C., and Boyles, S.D. (2021). "Convergence behavior for traffic assignment characterization metrics." Transportmetrica A: Transport Science 17 (4): 1244–1271.

[4] `https://www.statesman.com/NEWS/20160828/Cops-not-the-answer-to-problematic-intersection`

be simulated in the classroom and later built upon outside the classroom. My course design strives to minimize prerequisites and bring everyone to an equal starting point rapidly. This goal also aims to teach students to look at the big picture and convey it effectively to non-engineers, just as one would to the public on many infrastructure projects. Inclusive learning has many interpretations, and this is my take on it.

My fourth goal looks at developing student confidence in the classroom and treating failure as a learning experience. I proactively solicit mid-semester and end-semester feedback from my students, and the most echoed reason for lack of participation is the fear of saying something dumb or appearing stupid in front of the instructors or their peers. It is a rational fear of being judged and is tied to self-worth. It is more important to address the root of this problem: fear of failure. I want to stress that stumbling is acceptable and important to the process of learning. Students should be confident in translating this across instructors and disciplines. Removal of grades as the primary incentive provides a space to normalize innovation, failure, and adaptability. In more concrete terms, I plan to design my courses with assessments dropping the two lowest scores and assignments where student assessment of their knowledge is graded. Frequent project progress reviews will help me provide targeted and timely feedback.

My final goal for student learning is developing and encouraging lifelong learners. This is an ambitious goal that does not have a straightforward one-size-fits-all solution. I have strived to teach this to my students as well as my mentees, and have noticed that different personalities needed different techniques. These can entail providing pieces of the larger picture and letting their inquisitiveness fill the rest, or by charting out a clear linear path and letting them progress by themselves, among others. This is something I would like to gain more experience with through additional student interaction and engineering education research. By enabling students to be innovators and lifelong learners, we can progress beyond set practices.

I have set these goals for my teaching and my methods have been adapted to fulfill these goals. All goals aim to beyond the initial differences in student career paths and help students succeed in any environment, be it a job, graduate school, or something else. The underlying philosophy focuses on the Pareto principle, where 20% of the efforts account for 80% of the effects. My focus is on the 20% of transferable skills and habits which will help the students improve significantly. While the remaining 80% effort is not ignored, prioritization of skills helps me work with the students better. In conclusion, not only do I teach the students engineering, I wish to teach them skills that transfer to any discipline or career and help them succeed everywhere.