Statement of Teaching Philosophy

As a result of my teaching experiences, I have developed a teaching philosophy centered around evidence-based practices that 1) foster student engagement within the classroom, 2) enable students to become effective problem solvers, and 3) encourage students to relate course material to their own experience.

Students learn most effectively when they are actively engaged with the material through reading, writing, discussing, and problem solving. As a result, **I employ a variety of active learning techniques to encourage student engagement with course material**. For example, my Critical Analyses in Microbiology course featured reading and homework prior to lecture, a short in-class lecture, and an in-class small-group problem set followed by all-class discussion, all techniques shown to enhance learning outcomes. Students indicated that working in small groups most strongly contributed to their understanding of the scientific process, relative to other in-class activities. I also employ active learning techniques in traditional lecture settings. For example, a lecture on metabolic network modeling includes an in-class exercise on stoichiometric matrices of reaction networks and a think-pair-share opportunity for students to identify components of microbial biomass.

Problem solving skills are an important part of any education, and **I structure lectures, homework assignments, and exams to provide students with problem solving strategies**. My lectures begin with an illustration of the system, which serves to clearly define the problem and the known and unknown variables. I encourage students to establish fundamental equations (e.g., mass and energy balances), and explore derivations that may lead to the solution. My students have indicated that explicitly modeling a problem-solving strategy leaves them well-prepared to tackle novel problems on exams. Where possible, I also draw parallels to material students have learned previously (e.g., between Monod and Michaelis–Menten kinetics for cellular growth and enzyme kinetics), and solve examples with analytical solutions, to help students develop an intuition for related problems.

Finally, student learning is enhanced when students **draw connections** between the course material and their own experiences. In my own courses, I plan to encourage such connections through projects. For example, a biotechnology course project might require students to propose a process to produce a commercially valuable compound, with students allowed to choose the compound based on their own interests.

In pursuit of the above goals, **I solicit feedback throughout the semester and adapt my teaching accordingly**. For example, in my Critical Analyses course, students indicated that large-group discussions at the end of class spent too much time on technical details of that week's scientific manuscript, leaving no time for discussion of the work as a whole. I changed these discussions by inviting comment on broader issues associated with that week's topic, such as potential applications or ethical concerns. End-of-semester feedback revealed these modified discussions to be "very engaging and thought-inspiring" and "some of the best." In other classroom settings, I have revised my lectures to ensure better transmission of learning objectives, so students clearly understand what I expect them to learn. For example, I have updated a lecture on metabolic engineering to explicitly mention the metabolic design principles (e.g., redox balancing) underlying successful engineering strategies, so that students do not have to infer them.

In summary, my teaching strategies are focused on developing student engagement with their education through active learning and adaptive teaching. I hope to share my passion for the intersection of engineering and microbiology, and foster in my students a greater appreciation for the potential for the union of these two fields to solve pressing, real-world problems.