Teaching Philosophy

Today's students demand richer teaching experiences that prioritize content mastery and long-term retention of learning material while addressing real-world challenges. Moreover, these learning experiences must include active learning practices that enable students to genuinely engage in learning in an unscripted and authentic setting. As an instructor, I aim to encourage students' curiosity in exploring biological systems and phenomena while guiding them toward integrating these insights into their cognitive framework. In addition, I am committed to creating opportunities for my students to develop higher-order skills, such as quantitative reasoning, interdisciplinary thinking, and collaboration. Equipping students with these higher-order skills will be essential for their academic success and for navigating real-world challenges outside the classroom.

To cultivate a learning environment where students can authentically explore biological phenomena, care needs to be taken to ensure that active learning experiences lead to intellectual insight. I will employ backward design strategy to provide students with a clear purpose and explicit performance goals when crafting lesson plans. Each lesson will be structured with a clear focus on a particular concept and its relevance, followed by specific learning objectives and an assessment strategy for measuring content mastery. Students can develop a robust understanding of science while meeting specific performance requirements by using backward design in tandem with three-dimensional learning and biology systems-thinking frameworks. I envision fostering active participation in the classroom through cooperative learning activities, case studies, concept mapping/developing biological models on whiteboards, and lively classroom discussions using interactive questions. Through these activities, students will engage with the learning process at multiple levels and be challenged to operate at the upper levels of Bloom's taxonomy (i.e., synthesize, evaluate, construct) within the classroom. These practices will empower students to master concepts and facilitate long-term retention effectively.

Beyond imparting knowledge, a personal goal of mine is to equip students with the skills to thrive in our data-rich and interconnected world. This involves providing opportunities for students to demonstrate their capacity to think critically, make data-driven decisions, work within teams, and approach real-world issues from an interdisciplinary perspective. As such, my teaching objectives will foster the growth of quantitative reasoning, interdisciplinary thinking, and collaboration skills. Below are my thoughts/descriptions/examples of how students will receive training for each of these skills in my classroom.

My instructional approach will involve characterizing specific biological systems and phenomena using multiple model representations to promote quantitative reasoning skills. These representations will include visual, symbolic, and numerical elements.

Visual representations will involve the construction of diagrams to conceptualize system features, while symbolic representation will include developing/revising algebraic equations that describe the system. Numerical representations will apply these visual/symbolic models to simulated, real-world, or student-collected datasets. I plan to integrate various technologies, such as whiteboards and interactive applications in R/Python, to facilitate systems learning. Whiteboards will assist students in constructing diagrams and iteratively developing/revising models. Interactive applications, on the other hand, will enable students to dive deeper to explore algebraic models. For example, students can investigate how altering input parameters influences model outputs and decipher the biological meaning. By providing students with numerous model representations, I anticipate improving their ability to determine trends in data and make biological predictions/inferences. I intend to evaluate quantitative ability and confidence using some of the scholarly approaches I developed in my FAST Teaching-as-Research project. Beyond improving students' systems/model-level thinking, these different representations will strengthen their arithmetic thinking, data visualization, and graphical analysis skills by working with biological models in this context. Additionally, instructing students to construct *in silico* models will equip them with a valuable tool to visualize abstract concepts in future problem-solving scenarios outside the classroom.

To improve interdisciplinary thinking, I will adopt an inquiry-based learning approach where students can explore a topic from multidisciplinary perspectives in cooperative groups. My lesson plans will integrate concepts from various disciplines and provide examples of how interdisciplinary thinking/teams complement each other, leading to advancements in the field.

To enhance collaborative skills, students must be trained in the classroom to communicate and work with interdisciplinary and multicultural teams. Recognizing that teamwork is not an inherent skill for most individuals but essential in the workforce, I envision leaning on cooperative learning activities. For this, students will be placed into small groups, which would be intentionally formed instead of randomized. These groups would establish norms early in formation, such as active listening, mutual respect, and consensus-building. Additionally, during the semester, I plan to deliver mini-lectures on conflict resolution and share cultural competence and equity/inclusion training resources. Although this will not provide an immediate solution in creating team-oriented professionals, it will encourage the students to foster meaningful communication and self-accountability and support decentralized collaborations when working in teams.