Teaching Philosophy

As an ecologist and naturalist by heart, my teaching philosophy focuses on helping students develop critical thinking skills that foster a deep sense of scientific curiosity necessary to tackle science questions relevant to their everyday lives. To cultivate critical thinking, I believe a foundation of knowledge must first be built and then enhanced with layers of personal experiences, active learning, enthusiasm and engagement. To accomplish this in biology requires reconnecting students with nature, engaging them in the practice of science, and creating collaborative learning environments. My primary goal is to equip students with the breadth of understanding necessary to help reduce the impact humans have on the natural world. Thus, my pedagogy aims to provide the next generations of scientists with the tools to tackle complex ecological and biological problems.

I believe the most effective way of constructing knowledge in ecology is to immerse students in hands-on field-based learning. Our modern, technologically connected world has slowly removed students from nature and young scientists must reengage with the natural world to truly understand how it works. Approaches that engage students in the full scientific process, including field-based experiences, are extremely effective teaching tools. Taking students into the field provides services that the traditional classrooms can simply not achieve, by providing them with more immersive, integrated experiences with a scientific question. Field-based learning provides students with the opportunity to learn new skills, practice techniques, and connects them with real-world environmental issues. In my courses, I utilize field-based teaching methods that allow students to see how forest communities are structured, dig roots and mycorrhizae with their hands, and measure trees breathing. When students are immersed in field activities that integrate multiple aspects of ecosystem functioning they are better able to comprehend naturally occurring complex ecological phenomenon.

Scientific inquiry is central to my teaching philosophy and, therefore, to the way I design my courses. To accomplish this, courses I develop emphasize data collection, scientific writing, and a cornerstone of reading and discussing primary literature. I utilize jigsaw teaching principles when evaluating primary literature to establish a culture of collaborative learning in the classroom. Student groups read and evaluate different scientific articles related to lecture topics and then communicate the main findings to each other. This approach teaches students how to dissect a scientific paper, ask well-informed questions and promotes healthy debate as we jointly discuss the articles. With foundational knowledge in hand, students are mentored to explore new lines of questioning and to design and conduct a novel research component. I believe students in most biology courses should be encouraged to develop projects rather than repeating standardized laboratory experiments. I have found this strategy to increase both engagement with the material as well as comprehension. Not only is this more realistic of how everyday science is performed, but it fosters independent thinking and analytical skills. Research collaborations between teacher and students also have great reward potential if they can lead to co-authored publications.

Additionally, I believe it is fundamental to teach undergraduate students data science skillsets to visualize and critically interpret data. The role of data science also closes the circle with field-based experiences and scientific inquiry by allowing them to analyse the data they have collected. If we want students to succeed in biology related fields, they must also practice communicating scientific information creatively to a variety of audiences and digital media. To achieve this, I incorporate skill building in the R programming language in my courses. Students first learn how to manage, visualize, and analyse data and then how to present their findings in both traditional and web-based formats. I utilize a variety of assignments formats, including self-generated data, open-source data from foundational papers and the National Ecological Observatory Network's data portal to guide students through both experimental and applied data science problems. Teaching students how to code and solve a data science problem has undeniable impacts on their critical thinking skills by enhancing their

ability to clearly observe patterns, diagnose meaning, and creatively communicate findings. Overall, I believe that embracing comprehensive learning requires that students have access to and hands-on experience with the modern tools necessary to address complex multidisciplinary problems

I believe that achieving innovation in science works best in collaborative environments. One of the things I enjoy most about being a scientist is the opportunity to interact with people from different cultures, nationalities, religions, genders, sexual orientations and life experiences. Consequently, I believe that it is possible for students to stimulate new ways of thinking about age-old scientific questions by embracing intrinsic classroom diversity. Thus, my teaching philosophy also focuses on mentoring team-based student-driven elective courses to tackle complex socio-ecological issues. This method promotes active self-learning, diversity driven group work, networking and activism. Recently, I have had student groups develop ecological action plans for problems posed for the class by some of the nation's top ecologists. Student teams worked towards solutions on managing the algal explosion that is choking Caribbean coral reefs (Molly Timmers, NOAA), planning and managing how to reduce the vulnerability of human communities in fire prone areas of California (Scott Stephens, UC Berkley) and planning and managing for climate-resilient forests in the inter-mountain western USA (Bill Anderegg, Utah). In my classroom, students learn that the clearest path to solutions for these complicated issues requires a diverse array of human perspectives. By the end of the course students gain an appreciation for how collaborative working environments promote success in tackling issues that cross ecological, cultural and political boundaries.

I believe that developing learning partnerships with students is critical to their collegiate success. Effective teaching requires meeting a student at their level and fostering their development in a way that respects their interests and abilities. Establishing a rapport and mutual respect with students creates a relationship built on trust. This trust encourages the student to express themselves, embrace their vulnerabilities and hopefully achieve higher order thinking. I believe it is important to develop learning partnerships with students early and often in their undergraduate career. This ensures that mutually constructed knowledge continually occurs and creates a space for students' knowledge to be validated. I believe these learning partnerships also enhance my own teaching through insights from honest student feedback. Once trust and culture of listening are established, I can reflect upon the course design, learning outcomes and the vibe of the classroom environment on a personal level with students.

Teaching is the undeniable reward of being an academic and it has massive consequences. Developing critical thinking skills across undergraduate curricula requires immersive learning experiences that pushes the intellectual boundaries of students and fosters a creative and collaborative environment for them to reach their learning goals. Accomplishing this requires instructors who are knowledgeable and passionate about collaborative research, possess modern skillsets in science communication and can provide process-based instruction outside of the traditional classroom environment. As teaching is an art form but also a science, I have committed myself to stay informed of teaching advances to maintain my effectiveness as an educator throughout my career. At Colgate University, I participate in teaching round table discussions, attend workshops and observe my peers in the classroom. I feel that my teaching philosophy, interdisciplinary research background, interest in emergent data science and enthusiasm makes me well suited to teach undergraduate biology students. I specialize in teaching foundational biology courses, as well as upper level plant biology and ecology courses. I am capable of developing organismal-based curricula focused on plants, including; botany, plant evolution and plant physiological ecology. I am also interested in teaching general ecology, ecosystem ecology and developing a data science in ecology course.