Christopher Thawley
Teaching Philosophy Statement

I believe that the primary goal of a college education is to facilitate students' growth into independent, self-directed learners as they begin to direct themselves in selecting and acquiring the education needed to support themselves in their career and life choices. As an ecologist, my primary teaching goal is to provide students with the skills and knowledge to independently apply scientific thought and processes to real world issues. I believe that this goal is best achieved by integrating scientific independence across the curriculum and building skills that will allow students to achieve independence. To this end, I aim to develop students' abilities to ask important and insightful questions, use their knowledge and skill bases to devise creative ways to answer these questions, and communicate their self-generated information to diverse audiences.

In my experiences teaching biology labs from introductory to advanced levels, I have found that my students' biggest problems do not stem from a lack of knowledge, but a lack of free-thinking. Due to their high school experiences, students may see science as a predetermined process, where data that prove an expected answer should be found, and lab protocols are authoritative, standardized, and inflexible. To counter this, I've helped develop core labs which allow students to investigate problems of their own choosing and participate in flexible research without a predetermined "answer." As a TA for Bio 220 (Populations and Communities) at Penn State, I helped coordinate a course-wide lab (over 400 students) investigating allele frequency patterns in microsatellites taken from tissue samples collected during my field work. Students read primary literature dealing with ecological genetics and microsatellite techniques to become familiar with needed terms and background knowledge and used that knowledge to generate their own hypotheses. In the lab, we crowdsourced genetic research across all students in the course, allowing each lab group to be responsible for analyzing and scoring multiple microsatellite alleles for a specific lizard, providing ownership and investment in the data gathering process. Students then produced a large pooled dataset and tested their own hypotheses before presenting the results of their analyses to their classmates. This lab not only taught students standard skills (DNA extraction, PCR) and a basic knowledge of genetics, but also supported them in thinking creatively about the types of ecological questions genetic information can answer and allowed them an appropriate level of independence for first and second year students.

Field ecology and zoology are common topics for higher-level biology courses in many schools. These classes tend to emphasize traditional skills such as identification of common organisms, standard ecological field techniques, and common statistical analyses; these tools are critical to conducting field research in academic and professional positions, but teaching them alone is not sufficient to allow students to become independently-thinking scientists, a goal of many advanced students in these types of classes. As a TA, I have focused on building shorter two-week units that incorporate both these traditional approaches as well as independent research. Each unit focuses on a certain set of field techniques and an accompanying statistical analysis. Students learn these techniques in class and then work in small groups to create a question of their own interest that is addressable in an extended field lab. They generate short proposed research plans, implement them, and analyze the results for short presentations to the class. Students then have post-mortem discussions to highlight what worked well and generate suggestions for improvement. This approach has been successful in a Field Ecology class at Penn State and allows students to simultaneously learn important skills and knowledge while also building scientific independence.

I also encourage experienced students to take their learning outside my classroom. Experience in real teaching and research scenarios engages students, who recognize and are invested in the importance of their work. Outside the classroom projects can represent a culmination of the educational experience, with students thinking and acting independently. As a TA for Vertebrate Field Zoology at the University of Alabama, I coordinated the service learning component of the course, which saw students placed as educators in a local magnet school. In small groups, students led weekly extracurricular lessons for K-8th graders. I consulted with students and assisted them in adapting materials from our class to age appropriate lessons centered on animal diversity and conservation. Students highly valued this experience and saw passing on their knowledge and experience to younger students as very valuable. Students also gained confidence formulating their own ideas and communicating them to a diverse audience. Asking students to communicate their newfound knowledge can also "close the loop", by leading them to step back and think about how they and other individuals learn in many different ways.

Giving students the opportunity to be independent scientists can occur in higher level classrooms and in conjunction with ongoing research projects in my lab. In my role as a TA for the Field Ecology class at Penn State, I assisted pairs of students in developing semester long independent research projects. Student pairs generated their own questions, read primary literature, and, with minimal assistance, developed a research plan for small independent projects. Students conducted field research over a 6 week period and spent the remainder of the semester analyzing their results and developing a final report and presentation. Engaging with the entire process of scientific experimentation, from exploring relevant literature and experimental design to statistical analysis and presentation served as a capstone experience for senior Biology majors. Students also remarked that this project gave them confidence to conduct their own research and move into biology-related careers or graduate school. I encouraged students to work with systems I already have set up in the local area to jumpstart projects and have sites and equipment available. Students can go on to develop these projects into small publications or present their results at intramural symposia for undergraduate research.

In the future, I hope to develop classes which incorporate higher levels of inquiry-based activities, especially in introductory classes, and design opportunities for students to reflect more broadly on how they learn and interact with ecology. I believe that increasing inquiry-based learning gives students early opportunities to integrate scientific knowledge and skills as well as making them active participants in producing scientific knowledge. Focusing on inquiry also lets students experience the excitement and satisfaction of problem-solving and discovery that are key to the scientific process.