

Teaching statement- Dr. Christie Bahlai

Areas of teaching expertise *population ecology, quantitative research methods, ecological modeling techniques, data management, reproducible research methods, R for ecologists*

Teaching experience and outcomes

As a teacher, I have a passion for education and outreach at the intersection of environmental sciences and technology. I recently developed and taught a course in Reproducible Quantitative Methods to a group of six graduate students at Michigan State University. The reproducible research and open science movement draws on the connectivity afforded to us by the internet, allowing science to move forward in a more collaborative, more technologically empowered way, letting us ask bigger questions of our systems, and providing a common approach to bridge the gaps in communication between disciplines. Data science skills are increasingly in demand, both by funding agencies (i.e. NSF's March 2015 policy document #15052 "Today's Data, Tomorrow's Discoveries") and by early-career researchers, realizing the benefits of increased efficiency, reproducibility and collaboration that learning these skills can bring them. RQM is an entirely new offering I developed by drawing upon resources from the data science community, and materials are designed so they can be widely adopted. The course uses a project-based learning approach. Project-based learning hybridizes a traditional lecture with a student-led working group, which allows the course to be effectively customized to directly apply the principles to real data and real problems. We provide the added incentive of including the students on a publication resulting from their work- giving them concrete training in applying these skills in a way that is relevant to their field. Despite its newness, the course materials I have made available on the web (<https://cbahlai.github.io/rqm-template/>) have already been used in a seminar series for ecologists at the University of British Columbia, Canada, and two separate German colleagues (one an evolutionary biologist, one a biomedical scientist) are working with my materials to adapt them for offerings at their local institutions.

My strategy includes developing and using alternative approaches to classroom teaching which increase the availability of quality university education to non-traditional students. During my PhD, I taught three offerings as sessional instructor of a 3rd year chemical ecology course in 2007-2009, and in 2009-2010, I worked as a course consultant, significantly revising this course to update its content to include the latest scientific research, and develop new activities and assignments based on the new content. The course is a web-based offering of the University of Guelph's Office of Open Learning, and caters to returning students and re-training professionals, in addition to regularly enrolled undergraduate students, and typical enrollment is 100 to 125 students per semester. The course is popular among undergraduates at Guelph, and my teaching evaluations were consistently positive. In 2008, I received the Graduate Student Teaching Award of Merit from the North American Colleges and Teachers of Agriculture for my performance in this course.

I have a strong and productive history of mentorship. I've mentored undergraduate and graduate students, primarily providing resources to help them design and analyze experiments, and interpret statistical outputs, and write papers, resulting in numerous publications co-authored with mentored students. I particularly enjoy helping students solve their data and statistical problems, and am visited by many students seeking help in this area (and indeed, I now am very familiar with most common issues arising in datasets produced by many subfields of ecology!)

Outreach is an important and rewarding part of my teaching program which both allows me to reach broader audiences and get exposed to new ideas from outside my immediate community. To broaden the impact of my work, I maintain an active web presence- my blog about data management (<http://practicaldatamanagement.wordpress.com>) has more than 750 followers, and I have over 1450 followers, mostly early career scientists, on Twitter (@cbahlai). My outreach activities have expanded my network considerably and have led directly to my involvement in

Software Carpentry, Data Carpentry, and being awarded the Mozilla Fellowship for Science in its inaugural year.

Teaching philosophy

I believe that the appropriate use of technology in teaching and mentorship is a key factor in the recruitment and retention of underrepresented groups to science. At a purely practical level, for example, the option for web-based learning can provide the flexibility needed to students with familial or work commitments, making college education more feasible. However, technology also allows scientists to 'show their work' by publishing open notebooks, code and data, humanizing the process and allowing others to see the entry points. It is thus my goal to empower my students to navigate an increasingly data-intensive world. The ability to critically evaluate the quality of information, to develop proficiency for processing large amounts of information, and to meaningfully build on the work of others are essential skills for scientists and citizens alike.

As a teacher of environmental sciences and ecology it is my goal, in every class, to provide an experience that will engage students, and give them a chance to develop critical thinking skills that can be applied both to environmental science and other fields. I find that topics in our field lend themselves readily to classroom discussion and debate- at the core of almost every topic, there is almost always a question of how we use this information to improve human life, ecosystem health, etc.- when students can see this link clearly, they eagerly engage in course material.

I encourage information-literacy in all my classes; early each semester, I review literature research skills, have students perform a small library exercise, and provide a number of activities to help students learn to develop arguments and avoid misconduct. In my grading, I favor application, evaluation, and creativity over rote memorization. I am committed to providing detailed feedback which allows students to improve on future assignments. I find that the students are more likely to engage in assignments which encourage them to analyze their position on a topic, rather than just explain the topic.

When teaching skills-oriented topics like data management and analysis, I use a slightly different approach. I want my students to leave the classroom feeling comfortable with trying a variety of tools and approaches, so my goal is to demystify, provide context, and give them the vocabulary they need to move forward and start independently solving problems. A key element of this approach is live-coding: when working through problems, I will write the code directly as I teach. Live-coding enables students to engage in the lesson directly by suggesting next steps, de-bugging, and seeing the thought process I use when approaching the analysis. I've written in more depth about my approaches to teaching these subjects on my blog, see:

<http://practicaldatamanagement.wordpress.com/tag/teaching/>

My philosophy for graduate mentoring has been shaped by experiences with my own mentors. I aim to create a laboratory culture where there is flexibility involving approaches to problems, collaboration within and outside the lab group, and an open dialogue between lab members. When graduate students have the opportunity to develop research plans which play to their own strengths and work with other researchers, a higher level of productivity and engagement can be observed. It is my belief that this approach helps to foster confidence in trainees from traditionally underrepresented groups and makes science better- diversity in background and approaches to research directly leads to creativity of thought. I am strongly, personally, committed to developing a mentorship program that emphasizes data management and manipulation skills, open source publication, and collaboration. I believe open science holds us to a higher standard. Its values will not only improve the accessibility of the science produced by my trainees, it will also provide them with a skillset which will help to make them competitive in an increasingly data-driven, open source world. I look forward to gaining a position which allows me to develop an established teaching program which incorporates teaching and mentorship for both graduate and undergraduate students.