Brook T. Moyers — Teaching and Mentoring

Philosophy: I carry deep love for biological and human diversity, and I strive to center my work around that love so that my labor serves both societal and environmental needs. My teaching is learner-centered, and I ask learners to actively participate in the learning process. I work hard to create an inclusive and participatory environment while holding students to a high standard of critical thinking and problem solving. I focus on providing timely, frequent feedback: praising effort while encouraging improvement. With challenging assignments I use a scaffolding approach[1], where support is high at first and gradually reduced as students grow in confidence. When teaching practical skills or problem solving, my lessons are hands-on with worked-through demonstrations. In all classes I incorporate peer-to-peer interaction in the form of regular group discussion and problem solving. Finally, I strive to incorporate humor and my enthusiasm for the material into my teaching. I use these practices because pedagogical research shows that they are effective and increase equity in outcomes[2].

Training: I have substantial formal training in pedagogy. As a PhD student I completed two professional development of teaching certificates and then took a graduate-level course on teaching and learning in biology—easily the best course of my graduate experience! As a postdoc I facilitated an in-person learning community for the semester-long "Advancing Learning Through Evidence-Based STEM Teaching" offered by the Center for the Integration of Research, Teaching, and Learning. I next completed Carpentries instructor training, and I recently became certified to train Carpentries instructors myself. The greatest value of these opportunities was exposure to the research on effective teaching practices. My instructional principle at first was "teach how I was taught"—now, I use evidence-based practices to ensure that I reach as many students as possible.

Experience: As a Carpentries volunteer instructor I teach short workshops with collaboratively developed lesson material. I have taught 10 formal workshops with three foci: (1) reproducible scientific computing, (2) data management in ecology, and (3) an introduction to computational genomics. The learners at these workshops come from academia, government, industry, and the nonprofit sector at all career stages. I have also adapted Carpentries curricula into two summer-long programs for undergraduates, a weekly seminar for graduate students, and most recently three NIH-funded three-week workshops on genomic data science and cancer research, which I designed and directed.

At my current institution I developed a course on Ecological Genomics for advanced undergrad and graduate students that combines student-led primary literature discussion with hands-on bioinformatics projects. This course responded to departmental needs for training in bioinformatics, and aims to prepare students to undertake independent genomics research. I also resurrected our department's Population Genetics course, which serves advanced undergraduate and graduate students, and developed a year-long introductory seminar for first-year students that teaches fundamental university skills. Recently, I developed a course for our honors college titled "An Introduction to Genomic Data Science", which was funded by the NIH National Cancer Institute. Finally, I teach a 200-level core major course, Population Biology, which enrolls 150–200 students each term and covers population genetics, quantitative genetics, population dynamics & growth, population ecology, and epidemiology.. In my first term teaching this course (Spring 2020)

1. Wilson, K., and Devereux, L. (2014), Scaffolding theory: High challenge, high support in Academic Language and Learning (ALL) contexts. *J. Acad. Lang. Learn.* 8(3): A91–A100. https://journal.aall.org.au/index.php/jall/article/view/353
2. Theobald, E. J., et al. (2020) Active learning narrows achievement gaps for underrepresented students in undergraduate science, technology, engineering, and math. *PNAS* 117(12): 6476–6483. doi:10.1073/pnas.1916903117

I tripled time spent on hands-on problem solving and group discussion and partially flipped the classroom, assigning short readings and a reading quiz before every class. In 2021 we delivered the course entirely remotely, and in 2022 we transitioned to a flexible model, where students are able to fully synchronously participate in any class remotely or in-person during in-class problem solving. I recruited undergraduate learning assistants to make engagement across modalities seamless. This structure allows us to ask more complex, conceptual questions that draw out student understanding, even in a large class, because we are able to model, give opportunities to practice, and provide targeted feedback in several rounds before higher stakes assessments. Students who take this core course with me are less likely to fail than students who take it when I am not teaching the course. While there is always room for improvement, I am deeply proud of the impact I have made with this course on the >1000 students who have taken it with me.

Mentoring: In my career I have mentored students struggling in intense academic environments, starting as an undergraduate peer tutor. I am an informal advisor to many students at UMass Boston: often they will take a class with me and then continue to drop by my office to chat about their future plans. To date I have advised 23 undergraduate independent research projects (16 supported by competitive grants or fellowships). I institute two components for any student who joins my lab as a research assistant: (1) regular meetings to discuss the student's experiences and goals, and (2) the opportunity to develop an independent study project out of questions that arise while working on the main project. I ensure that all students are paid for the time they spend with the lab and pursuing their own research. Independent research experience increases a student's appeal to graduate programs and helps the student to determine if they will enjoy a research career, but all too often students must choose between a paying job and volunteer research experience, especially when not able to rely on familial financial support. Fourteen of my mentees have gone on to STEM graduate programs and careers (and some are still students).

Beyond one-on-one mentoring, I am engaged in professional development of early career researchers. In 2017, I was executive director for a summer program mentoring undergraduate researchers in biology at Colorado State. In summer 2020, I organized a six week bootcamp on developing applications for NSF's Graduate Research Fellowship Program. I have continued with this bootcamp through 2024, expanding from four to 20 participants, with a high success rate. I do this work because professional development of early career researchers is a key part of reducing barriers and increasing access to STEM career paths.

At Deep Springs I am prepared to teach a broad spectrum of natural science courses, particularly in biology, computer science, and environmental science. Courses in my area of expertise could include:

- *Plants & People (Ethnobotany)*: The interaction of plants and people explored from biological, historical, anthropological, and artistic perspectives.
- *Quantitative Genetics & Eugenics*: How has our understanding of the genetic basis of trait variation shaped and been shaped by cultural changes and scientific advancement?
- *The Human Genome*: History and current understanding of our shared genetic information.
- *Introduction to Scientific Computing*: Fundamental principles and skills in the use of computer programming in scientific research.
- *Statistical Thinking*: The application of statistical approaches in science and culture.