Empowered Learning

My approach to teaching and mentoring is broadly motivated by empowering people to reach their own goals and potential. I initially aim to build a relationship with a student or mentee so that we can establish a clear understanding of their goals. Once goals or targets are established, my role is to outline a path to accomplishment. From there I have found that a clear announcement of me delegating the action and ownership of the results is highly effective at motivating students to succeed. If things go well, it's yours! If things don't go well, I'm going to swoop in and help out. That second part is the key, hovering is too much for adult students, but being disengaged will inevitably leave students talking about "enough rope to hang themselves." Which takes the effort full circle back to an open communicative relationship and clear expectations about goals, roles, and responsibilities that are best established early and revisited often.

In one-on-one mentorship scenarios, this works well because it's a consistent conversation. In a classroom, it must be demonstrated with action as much as words: dedicated time for Q&As within lectures, responsive handling of homework, and realistic projects and classroom activities. While these are all features of the average engaging or impassioned instructor, my goal is to elevate the expectations by aligning the syllabus with a day 1 conversation about what students are expecting to gain from a course. This is challenging, which is why the explicit construction of a relationship based on ownership is key. If I take care of the relationship between the curriculum and the material and you take care of the effort, we'll all have success.

Methods, Data, Practice

My approach to classroom teaching is based on chunking material and time into Methods, Data, and Practice. I find this approach addresses the structure of scientific thinking and publication, speaks to functional practice in the field, and speaks to improving some of my own less-than-effective experiences in undergraduate and graduate education.

Methods first usually opens the door to talking about motivations, problems, study design, and the "why?" of the topic. I also find that this gets students thinking and talking; most college-level students have a sufficient base of knowledge to probe the "why" and "how" of a topic from a logic, ethics, bias, cost, or implications perspective. I find methods first is also good for teaching beyond the classroom as many students are trained to write their methods first. A basal understanding of explicit conveyance of "what did you do" is critical to early career scientists. For students heading to careers outside academia, government and industry are largely driven by guidance documents. No reason not to start building from the foundation.

Data allows us to start thinking about hypotheses, quantitative relationships, stakeholders, and end goals. We're usually headed towards the "what," "where," and "when" if we're talking about data. In my experience, the numerical components of scientific thinking cannot be understated.

These are often, after methods, the core concepts to convey to students. It's a lot more than numbers, even if it is just numbers.

Practice is really where we hone skills; it's the opportunity to bring real-world inclusive team work into the discussion. Much of the practice of science—academic and otherwise—is to actually work on a problem. Follow a method, generate data, and attempt to answer a question. The best components of my education were projects and team exercises, and I suspect they are the best components because they are the most realistic and have been the most applicable in my career. Practice is also where we can challenge standardized methods. Finding a home in the advancement of science is key to students that have a future in and outside academia. Standing on the shoulders of giants means you have to be willing to exceed their height.

In practice

We can apply the same Methods, Data, and Practice concepts to my background and training in ecotoxicology. Does it make sense to expose animals to an increasing series of chemical concentrations for a short period of time? What is acute lethality and why do we measure it? One does not need to be an experienced toxicologist to probe these questions and get a discussion rolling on methods of evaluating toxicity. Target conservation goals, sample size, detection limits, growth rates, EC50s, sensitivity distributions, decay rates, chemical structure, the list goes on. The core of understanding how human addition of chemical stressors to the landscape is based upon measures and estimates. As a principle, data interpretation and management have utility outside the research realm as much of an environmental managers' duties will be interpreting data that is provided by outside sources.

My teaching experience in the classroom is fairly specific, but my teaching and mentoring experience outside the classroom is extensive. I have co-designed and taught upper level undergraduate laboratory Conservation Biology and Aquatic Toxicology courses. The conservation biology class was a challenge as the lead faculty and myself were not aware of the limited statistical/quantitative training of the students in the department and we had to drastically adjust the methods in the course to ensure students were engaged with the material of the course and not learning a new programming language. Aquatic toxicology was a great experience in that the class size was small and we could work through realistic struggles that actually occur in laboratory toxicity tests and risk assessment data generation. I have also guest lectured "Intro to PFAS" lectures and a "Biomarkers and Biochemical Endpoints of Toxicological Studies" lecture. These lectures capture my expertise on a specific chemical class (per- and polyfluoroalkyl substances (PFAS)) and suborganismal toxicity test endpoints. These experiences are valuable in that tailoring the material and presentation to match the learning objectives and style of other faculty's courses was critical to success.

Outside the classroom is really where my delegated ownership approach has been honed. I have trained experienced and inexperienced technicians and colleagues in new methods in the laboratory and quantitative analyses and development of communication skills. I use the same approaches here—establish an early relationship built around the value of the new skills, then clarifying how we will get there, and following through with accountable feedback as we approach success. Specific examples of success include the transition of junior technical staff from learning the mechanics of test substance dilution to big picture "how to run a GLP study" and watching them successfully complete a guideline toxicity test without major intervention. An interesting development in my career is training colleagues 'laterally' that may be brushing up on new quantitative approaches. While they already expect to take ownership of their contribution, I have found the early conversation about expectations and goals seems to be a welcomed nuance.

Moving forward

I bring a wealth of experience in environmental toxicology and risk assessment research and application and can contribute to courses on ecotoxicology, fate and transport of chemicals, toxico-/pharmaco-kinetics, chemical-specific seminars, population modeling, and computational techniques (largely using R) and biostatistics. I would like to propose an upper-level course where students experienced in environmental toxicology and fish/wildlife management (courses I could contribute to) apply new statistical thinking and approaches (hierarchical population modeling, Bayesian analyses, probabilistic simulations, individual based models) to classic ecotoxicology problems (reduction in birth rate) and emerging questions in the field (combined stressors).

In conclusion, my approach to teaching and mentoring is to use Methods, Data, and Practice to empower students to reach their goals. This approach is specifically motivated by my experience training in and out of the classroom to support decisions about anthropogenic chemical modification of the landscape through ecological risk assessment.