Teaching Statement

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The primary purpose of an education is to teach people how to educate themselves, so that the process continues beyond school. The basic facts and concepts that I convey as a teacher help provide the foundation needed to build further knowledge. However, with years of life hopefully ahead in a rapidly changing world, my students will need to assimilate new ideas long after our classes together. Sources of information proliferate in this time of the internet, alternative facts, fake news, native advertising, predatory publishers, and artificial intelligence. People must process this torrent well to serve as functional members of their communities, let alone as scientists. Advancing technology means that everyone must continue to absorb new skills, often through self-teaching and informal exchanges, long after they leave school.

I prefer to teach by encouraging students to ask smart questions, to observe thoughtfully, and to learn through doing. In classroom teaching, I avoid lecturing, and instead tend toward experiential activities that encourage critical thinking and largely self-directed projects. For example, as a teaching assistant and sometimes lecturer in graduate level Urban Ecology at Duke, I divided students into groups that analyzed perspectives of different stakeholders in lawn maintenance before discussing as a class. Large classes are logistically efficient for disseminating information, but students learn more deeply when I mentor them in small groups or one-on-one. Luckily, my post-doctoral lab at Iowa State University Agricultural & Biosystems Engineering has afforded me such an opportunity for about a dozen undergraduate interns, allowing me to hone skills learned in teaching coursework and practice as part of my Certificate of College Teaching from Duke University. I have mentored several through independent research projects that began with questions initiated by doing fieldwork together.

These students benefit from my favorite way to learn and teach, which is taking people outdoors and teaching them to read whatever their very local landscape is ecologically. They begin to learn to actively make knowledge, rather than just passively receiving it, when I encourage them to notice details of their surroundings. Students practice thinking creatively and expressing ideas comprehensibly when I coax them to propose explanations for what they observe. They learn the fundamentals of critical thinking and problem solving when I help them to apply logic to verify and discard those explanations as possible, and figure out what information they need to finish the task. As a naturalist in a forest, for example, I have pointed out lower branches of an old oak tree that have mostly rotted away. From there, my students and I envisioned the landscape's transition, in the last century or so, from open field with a few trees, to brushy thicket, to forest. Then we discussed changes in human activity that underly this process. The imprint of historic decisions and timescale of environmental change became tangible, in a tree. More practically, my Iowa State students and I now use this process together every day we spend in the field, keeping running long term agricultural water conservation experiments that have helped shape Mississippi Basin policy going through shifts in environmental conditions, priorities, and politics. Observational and analytical skills thus practiced serve students well wherever their careers go.

Ideally, my students and I do not just observe a landscape, but also actively engage with it and its people, through measurement, experimentation, and discussion. My students learn that they can not only ask questions but answer them. For students at high school level and beyond, engaging directly with scientific literature first helps them believe that infinite scientific questions remain, many interesting and important. I hear statements beginning something like, "I can't believe we don't even know…" and off they go. My students have thus developed and begun to answer questions about temperature limitations on denitrification in drainage water, flashiness and agricultural flooding, belowground changes over years of prairie restoration or cover crops, jack-in-the-pulpit demography, and earthworm and shrub co-invasion of floodplains. Using real scientific tools, they learn what scientists can measure, and how well. Thus, they come to understand the powers and limits of scientific inference.

A greater proportion of what I teach tends to stick when I can get to know my students well enough to understand what uniquely interests and matters to them. This advantage helped me when I used an 11-year-old camper's fascination with violence to interest him in multiple trophic levels of invertebrates through the hunting behavior of an assassin bug, and again when I used a pet-training analogy to explain interaction terms to an animal-loving undergraduate intern. Often, the most important environmental issues for students stem not from mere interests, but from students' identities and values. These motivations can benefit environmental science, which needs a much greater diversity of people to engage in it fully than historically have gotten access, to right its injustices and blindspots. More importantly, students deserve the space, safety, and grace to bring as much of their whole selves to school as they wish. So, I encourage students to freely discuss and work on what feels most necessary to them. For example, I advised a group of Duke Master of Forestry students interested in geospatial analysis on a project on the legacies of historically racist planting of trees in our city, and they continued to engage with this issue politically after the course. Similarly, I helped a Latina undergraduate intern from Iowa connect her heritage and her Women & Gender Studies minor to our agricultural work to focus on farmer, landowner, and farm worker demographics often left out of decision-making in Midwestern agriculture.

Relating people's personal interests and experiences to subject material can guide them to action as well as to learning. People feel empowered when they realize they all have knowledge to contribute to environmental discussions and decision-making, no PhD needed. When I have approached ranchers and fishermen about potential conservation projects in the ecosystems in which they work, my ideas greatly improved, and they became more open to and interested in the benefits of undertaking conservation practices. These benefits became possible because I framed our time together as a dialogue, rather than just as me teaching them. My students also benefit from connections with a greater variety of experts than academics, and can come to realize thus, if they have not already, that their voices matter too. I also trade favors with other experts to directly add their highlights to education I provide and vice versa, as when I invited a climate policy PhD student to guest-star an undergraduate book discussion section of an introductory environmental science course I led at Duke, and engaged numerous area guest speakers to contribute to Duke River Center research chalk talks and to the Nature and People journal club I co-founded in graduate school. Such sharing leads to ideas and collaborations that otherwise lay dormant.

In the process of the scientific method, from forming a question to presenting their conclusions, my students learn that they personally can incrementally grow humanity's understanding of the world. They also inevitably experience some of the many pitfalls and joys of physically doing environmental science, from stumbling upon copperheads or baby rabbits, to examining their shriveled feet after a day in wet socks, to feeling the air change and hearing the birds quiet as the sun rises. I include disabled students in such experiences; everyone is capable of environmental science. All of us engage in lively discussions, usually over food, of scientific findings in journal clubs I have started and run. Each of us has endured the overwarm air of our top-floor computer spaces and occasional teasing when we leave the lab with goggle prints still on our faces or dusted in finely powdered soil. We all take breaks as needed, and facilitate expression of each other's individual strengths by dovetailing on tasks accordingly. Both as a teaching assistant at Duke and in mentoring interns at Iowa State now, students with disabilities and other difficulties learned to come to me, that we will adjust work until we meet their needs.

Only after doing a few scientific studies can students really know if they want to pursue a career in science. Even if the answer is no, they retain an understanding of science that no textbook can teach. My current undergraduate interns and I together produce and share knowledge with direct value to water conservation, and I could not be prouder of them. Even when their future career paths take some of them away from science, I know they will use abilities that I helped them to develop to do more good in the world, some in ways I cannot currently imagine. My goal as a teacher is to produce thoughtful and empowered citizens of Earth and their local communities, with experientially based understandings of and appreciations for nature, science, and knowledge. My shared experiences with my students remind me why I chose a career in environmental science. Our collaborations protect the research I co-produce from going stale and from neglect. I cannot think of a greater positive impact I can have than this one.