Teaching for the Anthropocene

The Anthropocene, the proposed geologic age or “event” of human-induced climate change and globalization, is a monumental wicked problem. As loaded as that concept is with other important perspectives, I believe chemistry, as “the fundamental science” of materiality, is one of the best ways to understand our response to it. But the solutions we need demand that we not see science as separate from our political and social considerations. The Anthropocene implies a need to transcend modes of disciplinary thinking that distinctly separate Nature and Culture: that science can exist without ethics, that our politics can understand the world without science, or that criticism and rhetoric are unimportant to improving how we do science. I have been developing the tools and frameworks to impart to students what is needed to become the compassionate, critical and ecologically minded students prepared to face these worldly changes with courage.

Transdisciplinary Vision

What I have found in my Environmental Arts and Humanities program is a path of working in practical interdisciplinary and transdisciplinary modes. Students would understand how writing and rhetoric, peer review and its process, and the multi-layered construction of science as a social and political influence are as important as knowing how to design an experiment, reference literature, synthesize compounds, or gather and interpret spectroscopic data in the production of important scientific knowledge.

In many ways, science and STEM education already strides to accomplish these ideals. The key difference sometimes only exists in the epistemological and ontological underpinning on how students view the work they do. What is still sometimes missing is the practice and modeling that can show how to make visible the intersectional and diversity needs of the kind of chemistry needed for the future. My teaching helps bring the compassion needed in higher education to open doors that have remained closed and discusses the ethics about how to do better science in a world that seems fragmented about its values. My students will demonstrate how to connect that philosophy to novel, well designed, and implemented pedagogical experiences and science. I believe that a richer perspective that can accommodate those views is vitally important for future work in the Anthropocene.

I have drawn upon many sources and trainings to form my teaching philosophy. I have taught as an undergraduate general chemistry teaching assistant and a graduate teaching assistant for integrated chemistry labs and career development classes. I have trained colleagues on various techniques in analytical chemistry. My training in the Undergraduate
Research and Writing Studio, along with previous work tutoring and being an assistant English teacher in Japan, has prepared me for working with English Language Learners and intersectional concerns surrounding science and writing. My theoretical frameworks draw upon social and environmental justice advocates like Paulo Freire, traditional ecological knowledge from Robin Wall Kimmerer, the science and technology studies of systems and socio-anthropology from Isabelle Stengers and Bruno Latour, and the process philosophy of Alfred North Whitehead. My interest in contemplative studies, mindfulness and meditation education and their benefits continues to work with these transdisciplinary modes of instruction. My perspective of nearly twenty years in Aikido, the Japanese martial art of reconciliation, has taught me that teaching is fundamentally about making and maintaining these complex connections.

Teaching an Integral Laboratory Experience

I was able to assist the teaching of The Theory and Practice of Science, a writing intensive course (WIC), taught by Kari Van Zee that strives to prepare biochemistry and biophysics students for careers in that field. While the WIC integrated chemistry labs I have also assisted teaching focus on writing lab reports, this WIC course prepares students for different kinds of writing and thinking challenges beyond the writing of science papers.

The teaching I have done most and would most enjoy doing in the future involves integrating humanities into science and STEM fields in a transdisciplinary framework. Building more transdisciplinarity means making those scientific rhetoric practices, the further humanities integrations, and critical reading and writing more clearly transgressive to what it means to do science. These classes have built towards that end already, but I think they can go further and make visible those interactions even more clearly.

What that looked like in this class was practicing and trying out those modes of career most likely to help students in the future. We read complex scientific articles from many sources, analyzed them for credibility and veracity, translated them for different audiences, worked in groups to present that translation, and peer reviewed many of those steps along the way. I introduced them, via a Prezi presentation, a contemplative and creative nonfiction writing workshop to develop those tools (see Teaching Responsibilities below and my Online Teaching Portfolio for a link). Between instructor feedback and peer review, multiple drafts of several documents improved student writing and communication in these multiple modes. We concluded the course with career development roadmaps that emphasized looking through these exercises and future career planning ten-years out. My students have expressed a great deal of thanks for having been through the class to prepare their futures. I knew my role as a facilitator was working when students bring novel ideas into discussion, teach and create with each other, and generate passion for their learning and projected endeavors.

I took my experience from Professor Zee’s course and brought it into the teaching of the integrated chemistry laboratory. Peer review is a fundamental process to making science effective, especially in academic settings. I created a peer review training document, briefly
lectured, and facilitated within Canvas a peer review process for student report drafts. This process primarily intended students to get to see what other students had produced, having few other opportunities outside of class to often see each other's work. While some students may naturally collaborate and share their work, this is not guaranteed; making sure students see other work to gain ideas and learn from each other is better pedagogy. The other instructors, teaching assistants, and I helped monitor the peer reviews making sure they met our discussed class standards delivered via Canvas rubric (please see Appendix C for an example). On successive drafts of reports, students may sometimes drastically change their reports to fit the quality of peer reviewed documents they saw. In other submissions students made minor changes, emulating other students’ prose style, or even mirror minor changes in figures and descriptions of instrumentation or scientific observations. I have found the cross-pollination of scientific rhetoric between students to be more appropriate and accessible for those students. As a full instructor, I would further integrate the practical modes of rhetorical examination this exemplified so that students could more clearly understand it for themselves as well. See Appendix D for a further proposal of how an online discussion of peer review and roleplaying disciplines may further demonstrate the transdisciplinarity present in chemistry.

**Methods for Developing Resilient Learners**

The kind of classroom facilitation I strive for and would demonstrate in a classroom is congruent with the work of Gerald O. Grow (1991). The teacher as facilitator of learning is a potent transformation from teacher as expert or authoritarian—the traditional academic “sage on the stage.” I support Grow’s intention of meeting students with the right kind of teaching depending on their pedagogical needs. My teaching requires making active adaptations to students to form the classroom connections necessary to work with students where they are, modifying my teaching as needed for the students’ level and involvement. This model can be further elaborated by additional teaching style typologies as articulated by Anthony Grasha (1996) that help to identify more refined styles in the classroom. Grow’s model loops between the expert exemplary practices and products that students may need to see, but also builds confidence in students, and moves towards self-directed learning and collaboration.

Primarily this supports the kind of active learning present in the laboratory learning spaces I have taught. Students are typically already in the upper division of their undergraduate coursework and have much of their basic understanding developed. As they apply more of this knowledge, I as a facilitator help them be aware of gaps, expertly guide and demonstrate new skills, and leave them alone to their experimental work with the keen eye for safety and aid if needed.

If a student has trouble with a new piece of chemistry software, it usually only takes a short conversation to understand how much they have tried, how much interest and patience they have to give at a teachable moment. I can then respond to how directive or collaborative to give my response and further instruction. I have posed questions if I think they are being too lackadaisical, and I have helped them at the computer screen, walking them through the lab manual they have read and tried if it is a matter of deciphering complex instructional
materials.

Other classes I would teach really rely upon a similar model. Laboratories in chemistry are little different from the intention of writing workshops: spaces for making mistakes, taking creative risks, and working alone and with others on refining their learning and productivity habits. These laboratory like experiences help to bring active participation and learning into any content orientation. I do similar work in the Undergraduate Research and Writing Studio, and, is a very similar model to how my Aikido dojo functions as well. My work as a transdisciplinary teacher is primarily a matter of seeing the work already done as translatable between disciplines already known, gaining the knowledge, articulation, or refinement to trace and make visible those congruencies.

This further plays out by gathering student insight and directives to participate with them in designing class content and aspects (assignments, expectations, penalties) that can be negotiated within the larger academic framework. Direct mid-term student evaluations of my teaching are collected to address classroom reorientations. I also examine student work and incorporate potential curriculum changes and adaptations to my teaching and facilitation to address how well, or not, the students are performing.

Connection with my students, sensitivity to their learning process, and dynamic written and multi-media feedback is the key to flexible and engaging learning environments. These also happen to be the best ways I know to prepare students to foster connection to land, build resilient communities, and navigate the political ecologies needed to address the Anthropocenic challenges we face. This is the embodiment of resilience that students need for the future.

---Thank you for reading!

Please visit my website’s Teaching page and my further Teaching Portfolio page to access my online teaching portfolio.