March 30, 2015

Dr. Kathryn Docherty  
Department of Biological Sciences

Dear Dr. Docherty,

I am honored to be nominated for the Latva Teaching Award. Below I describe an innovative project that I developed for BIOS 1620, with the goals of improving student understanding of scientific controversies, the use of evidence to guide science and conservation, and the conservation status of animals of the world. The project also provides them opportunities to develop skills in research, critical thinking, synthesis, and written and verbal communication.

Early in the semester, I review the scientific method and emphasize two key points: the difference between theory and hypothesis and between scientific and non-scientific controversies. My choice to emphasize these points developed from student misconceptions of evolution and climate change: “evolution is only theory”, we should “teach the controversy”, and the evidence for climate change is anything but clear. By framing a conversation around these key points, my goal is help students understand that within science, neither evolution nor climate change are controversial due to convincing and abundant evidence and that any controversy that does exist occurs within the public, not scientific, realm. To further this goal, I developed a project that asks students explore a topic that is controversial within conservation biology: “de-extinction”, or the use of cloning and surrogacy to resurrect extinct species. Proponents argue that cloning may be a way to correct man’s folly, while opponents voice concerns that, given the costs of reconstructing genomes of extinct species, limited conservation funds may be re-directed away from the conservation of threatened species that are still with us. No consensus exists and students are asked to explore evidence on both sides of the controversy.

The first step in this project consists of a lecture during which I set the big picture regarding the conservation status of animals of the world. Next, in each lab section, we hold a “study species raffle”, in which students draw at random either an extinct or endangered species; we need to understand if this technique could be applied to animals already extinct as well as those under threat. During this same lab, students receive library instruction from science librarian Carrie Leatherman, who guides them through literature searches of their study species. Students gather evidence regarding conservation status of their species, the reasons for its status, and information about its ecology and evolution, and produce for their first homework assignment, an annotated bibliography of some of these sources. In the following week, each student introduces their study species to the class, giving a brief summary of its conservation statues and threat. Students also hear from the scientists themselves: an entire TED talk event, TEDEx, is available online. I selected three talks, one by a strong proponent of the idea, one by a strong opponent, and one a researcher standing somewhere in the middle. Students watch these talks, discuss the main evidence for each position and then they search the literature for independent verification of the evidence. The second homework for the project is assigned: I ask students to write a reflective essay, outlining their position on the topic and the specific evidence that was most influential is helping them form this position. Over the next two weeks, students complete two more assignments that are designed to explore the practical aspects of de-extinction: will this work in reality? To do this, students first explore their study species by answering a series of questions (e.g. what is/was the species geographical range? its habitat requirements? is habitat available? do threats persist?). De-extinction relies on the use of closely related species to act as surrogates for clones of the extinct species; therefore the next assignment asks them these same questions about a possible surrogate species. In
both assignments, these questions are formatted as tables, which students will turn in as evidence for their final assignment. The final assignment asks students to synthesize their work into a paper: what are the theoretical arguments for and against de-extinction (reflective essays), could the idea be implemented in practice for their study and surrogate species (assignments, tables), and final conclusions from both a practical and a theoretical point of view (giving students the ability to conclude they agree with the idea in theory, but not in practice, for example). The project then culminates in the last lab of the semester in small-group discussions to evaluate whether the study species are candidates for de-extinction and in the case of endangered species, whether current conservation strategies appear to be sufficient to prevent extinction. As a group, each lab then debates these findings and attempt to develop a consensus statement based on evidence from their study species, and evidence regarding prospects for de-extinction and ongoing conservation (dissenting positions, with evidence, are permitted as well). TAs send me the consensus statements and dissents from their labs and I present them to the class as a whole in lecture.

Students get a lot out of the project, both in terms of understanding of science and conservation, but also for the process of writing. At the end, many students understand that I’ve taken the complex task of writing a scientific paper, broken it down into a series of steps, and then re-built it into the final assignment. My hope is that they take this approach and the fundamental idea that scientific understanding is based on evidence to future courses in our program.

Sincerely,
Sharon Gill