

Building context for Students in Environmental Sciences

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Preamble to essay: This work represents only one opinion and set of observations about the Environmental Sciences degree program in the Department of Earth and Planetary Sciences at the University of New Mexico. This may not be a representation of the consensus opinion of faculty in the Department. In this essay, I focus on students in the Environmental Sciences degree program, excluding the more standard geology degree program since this was the focus of the informational website content.

Essay:

Students at the University of New Mexico come from a broad range of experiences and backgrounds; therefore we have a diversity of student views on what aspects of Environmental Science are relevant for society. A student's primary view of societal issues of significance may focus primarily on local environmental concerns, including building an understanding of impacts of uranium mining on tribal and surrounding lands or gaining an understanding of contaminant movement at a fuel spill in Albuquerque. Yet others may see the global issues of warming and other associated changes as driving their interest in environmental sciences. Others are interested in aspects of both local and global issues. One common link between all students, however, is that they view building scientific knowledge about how the environment 'works' is critical for society as we move forward into this world of uncertainty due to global-scale anthropogenic change. In that way, linking societal relevance into an Environmental Sciences curriculum is relatively straight-forward since the students usually come primed with this understanding. Our challenge is to link these diverse views on significance of Environmental Sciences to fundamental basics of Earth systems while training students on how science is accomplished.

Presently, we address this challenge through various exercises in our classes and through student involvement in undergraduate research activities. In several courses, we use data collected from local sites as exercises. For example, in our hydrology courses have exercises that evaluate contaminant movement in groundwater systems. We use these exercises as a stepping stone to assessing maps and data from local environmental cleanup sites, like the fuel spill at the Kirkland Air Force Base. Other courses spend time assessing the findings of the Intergovernmental Panel on Climate Change (IPCC). In our capstone field-based course, students learn to collect and interpret data from local sites. Through these exercises, we work to directly link the 'book' learning science to societally-relevant issues that can be informed by the science they are learning.

Student involvement in research projects allows the student to dig deeper into the science and follow aspects of Environmental Science that are of direct interest to that individual student. Though not all of our students are involved in research, those that participate in research work on projects ranging from basic understandings of aspects of the Earth system to applied projects in Environmental Science. Some of the applied research projects include water quality measures of springs in the region or geothermal resource assessment. Others have evaluated aspects of climate that impact water resources in New Mexico. Our students have presented work not only at national meetings such as GSA, but some have

presented their findings to local stakeholders. Additionally, all students involved in research and those in the capstone course present their findings to the Department in our end of year seminar, thus reaching students who are earlier in their program and showing how involvement in undergraduate research can lead to studies relevant to New Mexico. When such research opportunities exist, the direct link to societal relevance is clear.

Though our current program in Environmental Sciences presents information and provides exercises that explicitly tie societal relevance to the Earth science they are learning, at present this is mostly done on an ad hoc basis by individual faculty members in their classes. We are currently working on revising the Environmental Sciences curriculum and an aspect of this curriculum change is focused on formalizing the societal relevance into the program. Part of this may be accomplished through a service learning capstone course. Additionally, the committees who are developing objectives for new courses are looking for opportunities to directly link aspects of the learning to issues directly affecting New Mexico and beyond. We are working to also link these concepts between several courses, using data sets collected and assessed in earlier classes to evaluate new aspects from these data. Though this is in the development phase, we plan to explicitly incorporate societal relevance into the new core courses and may use data sets that show this relevance.

Teaching Environmental Science from an Earth science perspective allows our department to directly tie into students' predisposed interest in how science links to society. The integrative approach that we take and the ties to societal needs resonate with a diverse population of students. A high-context approach, where linkages between various aspects of science and links to society are explicitly articulated, tends to attract a different student population than the typical low-context, silo approach to science (where individual topics, such as chemistry or biology or geology, are taught without articulating links between each topic). Thus, through this approach, we tend to attract a very diverse student population. The department is keeping this in mind as we redesign our curriculum, and we see this as an opportunity to broaden access to science for a culturally and ideologically diverse student population.