INCORPORATING ENVIRONMENTAL ISSUES ACROSS THE CURRICULUM

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Scientists study the world around them and try to understand how it works; geoscientists focus on the earth. Engineers design things to serve a purpose. We have been asked to write about approaches to integrating geoscience and engineering within our teaching. As I see it there are several ways that geoscience and engineering are inherently linked. One intersection of geoscience and engineering occurs when engineers literally redesign the topography of the earth: creating levies, straightening river channels, creating roads on or through mountains, making islands into peninsulas, etc. Another intersection occurs when engineers design means of removing materials found in the earth: coal, oil, gemstones, limestone, etc. All of these practices have been going on for a long time, but our ability to do them on a large scale continues to increase, as does our ability to measure the environmental impact of these actions. As a result, it becomes more and more important for us as a society to consider the consequences of these actions on the earth and on the people most affected by these actions. It becomes our responsibility to mitigate the damage done by previous generations and develop sustainable practices for the future. As educators it is important to pass this message along to the future engineers and geoscientists, as well as other majors that find their way into our classrooms, creating a more informed generation of global citizens.

My approach to integrating geoscience and engineering is to incorporate applicable sustainability and other environmental issues into each course. I believe environmental issues can be weaved non-disruptively into most classes and that this will have a greater impact than any single environmental course, as it will reach more of the student body and relate it to other areas of study. For instance, in my introductory physics classes I make a special point in the thermal conductivity unit to emphasize the purpose of insulation and how much energy is lost through single pane windows as compared to double paned windows. We use the continuity equation to calculate the amount of water flowing through an opening in the fluids chapter and consider the impact of a small flow like a leak over a long period of time. Simple choices of problems and their presentation can add an environmental flavor without deviating from the

primary content of this course. I am also in the process of developing a natural science course focusing on rivers and streams, which will have a significant focus on preserving our water resources. We will touch on the positive and negative effects of locks and dams, a local feature for the students as our city (Davenport, IA) is on the Mississippi. We will also discuss the straightening of drainage ditches, which is another familiar feature of Iowa. Connecting the geoscience concepts to local features and geography should help the material seem relevant to the students. I will also be incorporating themes from my research on the region under a stream through which stream water flows (hyporheic zone), which acts as a filter for nutrients and pollutants. This will tie into the importance of developing sustainable agricultural practice in order to reduce the hypoxia in the Gulf of Mexico. Ideally all engineering and science courses would contain environmental elements and even many non-STEM courses like ethics and political science would incorporate some environmental discussion. I hope that by having environmental components, many of which integrate geoscience and engineering, in multiple courses it will help environmentalism become a part of the students' outlook and will influence their approach to solving real problems in their future occupations.