



ENVIRONMENTAL AND ECOLOGICAL ENGINEERING

EEE Seminar

DATE: Friday, April 1, 2016

TIME: 3:30 P.M.

LOCATION: Potter 234, Fu Room

Susan E. Powers, PhD, PE

**Spence Professor of Sustainable Environmental Systems and the Director of the Institute for a Sustainable Environment
Clarkson University Potsdam, NY**

Energy and climate – Imperative concepts for tomorrow’s engineers

Abstract

Engineers must take a leading role in addressing the challenges of mitigating climate change and adapting to the inevitable changes that our world is facing. Yet climate change classes that target engineering students are scarce. Technical education must focus on the problem formulation and solutions that consider multiple, complex interactions between engineered systems and the Earth’s climate system and recognize that transformation raises societal challenges, including trade-offs among benefits, costs, and risks. Moreover, improving engineering students’ climate science literacy will require educational strategies that also inspire students’ motivation to work toward their solution.

The objective of this presentation is to highlight the content and pedagogical approach used in a new climate science course for engineers that has been taught 5 semesters that helped to contribute to significant gains in engineering students’ climate literacy and critical thinking competencies. The quasi-experimental study examined the overall status of climate literacy and evaluates changes in students’ climate-related content knowledge, affect, and behavioral attributes following completion of the semester course.

Before taking the climate change class, students had fairly low scores on all three climate literacy sub-scales, with only 20% of the students surpassing a knowledge “passing” rate of 70%. This is consistent with the generally low climate literacy among college students. As a whole, students demonstrated significant gains ($p < 0.05$) in climate-related content knowledge, affect, and behavior. Mean post scores were above a “passing” cutoff ($>70\%$) for all three subscales.

Several variables were considered to better understand the spread in student climate literacy. The most important (though not wholly independent) variables were whether the students had an introduction to climate change in a prior class and their gender. Mechanical Engineering students – most of whom were males who had not had a prior class in climate, had the lowest initial affect and behavior scores, but the greatest amount of positive change as a result of the class.

Assessment of semester project reports with a critical thinking rubric showed that the students did an excellent job of formulating problem statements and solutions in a manner that incorporated a multidimensional systems perspective. These skills are sometimes foreign to technically focused, number crunching engineering students, but are critical for using their engineering skills and profession to address energy challenges to mitigate climate change and strategies for adaptation.

BIO

Susan E. Powers is the Spence Professor of Sustainable Environmental Systems and the Director of the Institute for a Sustainable Environment at Clarkson University. She received her Ph.D. in Environmental Engineering from the University of Michigan in 1992 and has two years of experience as a project engineer with Engineering Science (now Parsons) in Syracuse, New York.

Dr. Powers is using her current academic position to promote project-based learning experiences to promote sustainability for college students. She is teaching classes and working with several student groups to analyze and improve existing campus operations and design and innovate new facilities to reduce our campus’ impact on the environment and society. The goal in all of these projects is to provide real-world, messy and open ended projects to students to enhance their education both in technical aspects as well as team work, communication and integrating sustainability as a critical project criterion.