Title: Preparing the Next Generation of Bio-geotechnical Engineers, Scientists and Educators

Center: ERC for Bio-mediated and Bio-inspired Geotechnics (CBBG)

Achievement Date: 2016

Outcome/Accomplishment: Connections were made between CBBG faculty and graduate students, educational partners and the local community that were beneficial to all parties involved. Results include: 1) a two-course series training graduate students in educational outreach design, 2) production of geotechnical education modules for K-12 and/or undergraduate audiences, 3) a professional development workshop in sustainable engineering for teachers, and 4) a camp to encourage girls in civil engineering.

Impact and Benefit: These activities demonstrate the accessibility of engineering topics, particularly civil engineering, in K-12 curriculum by relating engineering to society’s needs and greatest challenges. Educational modules are developed with input from educators and engineers/scientists, so that they effectively promote current research areas while meeting objectives of the Common Core and Next Generation Science Standards. The final educational products will be freely available to all K-12 educators. The camp fosters confidence and cohesiveness in girls from 3rd to 5th grade, an age when confidence begins to falter, as girls undertake design challenges with their teams, converse with engineering graduate students, and share discussions on imposter syndrome, role models, and long-term goals. In addition, to preparing the next generation of engineering students, the activities also allow the next generation of engaged engineering professors to develop their teaching skills. Communicating complex research topics to educators and students, graduate students cultivate skills necessary to be effective in academia or industry.

Explanation and Background: Beginning in January 2016, Prof. Colleen Bronner developed a graduate course in Engineering Educational Outreach Design. After an introduction to educational strategies for inclusive learning, geotechnical and water resources engineering graduate students designed educational modules related to their research, targeting K-12 or undergraduate students. In July 2016, CBBG students presented their modules to middle school teachers during the CBBG-sponsored Sustainable Engineering Workshop for Middle School Teachers. The teachers, inspired by the students, immediately began brainstorming ideas for incorporating the biogeotechnical content into their classrooms. They offered helpful suggestions for education module improvements based on their expertise in K-12 education. The following week, the biogeotechnical modules were used during the CBBG-sponsored Girls Saving the World through Engineering Day Camp to engage girls in sustainable engineering. Each of the five days was dedicated to a separate topic related to the CBBG (e.g., bio-inspired designs for infrastructure protection; bio-mediated designs for mitigating damage from earthquakes, and measuring sustainability through life cycle assessment). Pictures of specific activities are located on UC Davis’s CBBG Facebook page (https://www.facebook.com/ucdcbbg/).