

PROJECT SUMMARY

Overview:

ChANgE Chem Lab is a Level I Development and Implementation proposal in the Engaged Student Learning Track that will build on the success of the NSF-funded TUES project (DUE-1245068; PI-Crippen, co-PIs Brucat & Wu) to improve the quality of STEM education by applying a unique approach to transform the laboratory curriculum of undergraduate general chemistry for engineers to a more contextually relevant and engaging experience for students. The transformative power involves designing for retention of underrepresented student groups with rich context of real-world engineering challenges. We will use cognitive apprenticeship, a transformative educational framework that is steeped in our understanding of how students learn, to develop 6 design projects, each including 3 weeks of inquiry-based laboratory experiments and support materials for a sequence of two courses that emulate and make explicit, an engineer's way of thinking, learning and collaborating. This transformed curriculum will use the Engineering Grand Challenges (e.g., provide access to clean water, engineer the tools for scientific discovery) as fundamental organizing principles in practical engineering problems, communicated as human-interest stories. We will support student success with design structures that engage deep learning strategies that embody our understanding of effective learning. In addition to addressing the immediate challenge of retention, the project offers a rare opportunity to integrate a novel learning approach into a revolutionary way of using a new state-of-the-art chemistry building on the UF campus.

Intellectual Merit :

ChANgE Chem Lab will substantially inform our understanding of how to actualize the potential of laboratory activities for broadening participation in STEM. ChANgE Chem Lab will leverage and build upon the intellectual merit from prior support (DUE-1245068: PI-Crippen, co-PIs Brucat & Wu), which includes a validated model of project-based learning of general chemistry for engineers that is proven successful for supporting the retention of underrepresented students. ChANgE Chem Lab's unique potential for generating new knowledge is based upon the deep experience and expertise of the interdisciplinary project team, the access to high-quality resources (human and physical), and an ongoing and deep institutional commitment at the University of Florida. A laboratory curriculum based in the rich context of real-world engineering coupled with design elements that support the retention of all students is a distinctively transformative approach.

Broader Impacts :

ChANgE Chem Lab will achieve broader impact by increasing the number and diversity of undergraduate students retained in STEM and the engineering career pathway. The project will directly involve 675 students and 15 teaching assistants, and 5 different instructors, of which 30% are typically from an underrepresented population. With the approach of explicitly designing for the retention of underrepresented students, ChANgE Chem Lab will address the low retention rate during the first two-years of college for students who major in engineering, thus broadening participation in STEM. By contributing a more diverse and better-qualified engineering workforce, ChANgE Chem Lab serves society by facilitating sustained economic growth, national security, and an informed electorate. Developing a transferable model and communicating results through established networks with socially adopted technologies affords wide dissemination. The interdisciplinary collaboration supporting the fulfillment of the project goals, processes and models as outcomes significantly enhance the infrastructure for continued and ongoing research and education in STEM at UF.