2017-2018 Tier One Program Grant Recipients

Bridging the Humanities and Hard Sciences: Transformational Learning & Retention of Latino/a and First Generation Students via a Global Borderlands Classroom

Sonia Hernandez, Francisco Olivera, Shannon Van Zandt

"Bridging the Humanities and Hard Sciences: Transformational Learning, Retention of Latino/a and First Generation Students via a Global Borderlands Classroom" proposes to combine history, civil engineering, and architecture and urban planning students to 1). Bridge the gap between the humanities and the hard sciences by engaging students with one another as they conduct cross-disciplinary field research in the classroom and along the south Texas borderlands. 2). By doing so it has the potential to create globally sensitive students that will create solutions to real-life problems given their academic training in courses dealing with: demographic shifts, race and ethnicity issues, immigration policies, infrastructure and environmental challenges and their engineering solutions in impoverished areas, border economic challenges, housing and health issues among minority populations, to name a few. 3). Students will be rigorously trained with "in-the-field skills" that are transferable to professional jobs beyond graduation. 4). By allowing minority students, particularly Latino students, to work closely with non-Latino students, the project provides an opportunity to not only create friendships but also leads to the exchange of research ideas from different disciplines. Overall, the project has the potential to create a more well-rounded Aggie student, trained in multi- disciplinary research and methods and one that is prepared for a 21st Century, global, workforce. In short, this is the type of transformational learning in a global classroom that has the potential to actually transform our students. Equally important is the project's potential to create a welcoming environment for Latino students that will help with retention.

Circular Economy Design, Engineering, and Fabrication Project

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The Circular Economy Design, Engineering, & Fabrication Project (CDF) is a joint effort between the Department of Architecture and the Department of Construction Science at the College of Architecture, The Department of Engineering Technology and Industrial Distribution at the College of Engineering and The Department of Mathematics at the College of Science. Industry partners include General Motors, United States Business Council for Sustainable Development (US BCSD) and Zahner Metals. The CDF Project will engage multidisciplinary teams of faculty and approximately 50 graduate students/year directly in a transformational learning environment. Students' teams from four departments will be given real-world projects related to the circular economy revolution. The project intends to introduce a

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novel approach to architectural product design through the integration of system thinking and non-hazards industrial wasteflows repurposing into the building industry. We argue that a resource revolution is making way for a new paradigm shift, which is emerging through the adoption of creative reuse, business processes, and circular economy systems. We intend to focus on adding value by design to the enormous amount of discarded materials from the automotive industry. We expect to offer new solutions for building envelopes designed and engineered from industrial wasteflows, which will create a new unconventional circular business model. The project will provide students with the unique opportunity to (1) Design and engineer building envelope solutions from unconventional by-product wasteflows. (2) Collaborate with non-discipline peers and industry experts. (3) Provide novel solutions to real world problems in waste reduction and synergistic economy. (4) Engage Life Cycle Analysis and environmental impact assessment skills to support sustainable circular economy business models.

SimCRAFT: A Virtual Design Platform for Experiential Learning and Collaborative Engineering Design

Gregory Chamitoff, Daniele Mortari, Eric Ragan, Sharath Girimaji

Recent advances in virtual reality (VR) and mixed-reality technology look to radically change the way we do just about everything. Engineering design processes are likewise going to be transformed drastically. Everything we build in the future, will soon be designed, built, tested**,** and experienced virtually before it ever exists in the real world. This project proposes to develop a virtual reality platform that can be used to learn and conduct collaborative engineering design. The students of today, will need to embrace and master the tools to model, simulate, integrate and prove their designs in virtual environments. SimCRAFT will create the opportunity for experiential learning, which is now well-established as being critical for teaching efficiency and student retention. SimCRAFT is an on-line open-source virtual collaborative platform for multidisciplinary system engineering and simulation. It will enable individuals, universities, corporations**,** and agencies to collaborate on complex engineering designs in an integrated virtual environment. Physical and computational models of engineering systems can be incorporated into a high fidelity VR simulation with other shared models that are connected, tested and improved. SimCRAFT also enables human in-the-loop testing and the evaluation of interfaces and operational scenarios. As a truly multi-disciplinary project, SimCRAFT aims to engage hundreds of students in developing wide ranging applications in such areas as spaceflight mission design, off-shore ocean exploration, architectural visualization, human-machine interfaces and more. Students will gain valuable experience with the latest computational, modeling and VR tools, while developing the platform and designing real-world applications through student projects and competitions.