2019 Teaching and Learning Collaboratory (TLC) Seed Proposal Winners

The Virtual Chemical Plant: Innovations in Chemical Engineering Education

Ronald Hedden (Chemical and Biological Engineering)

Our project aims to provide innovations in undergraduate chemical engineering education through the use of Virtual Reality (VR) in the classroom. A “Virtual Chemical Plant” simulation environment will be developed and implemented in undergraduate CHME courses to advance capabilities in teaching chemical process dynamics and control, chemical reactor design, process safety, and plant design.

A fully immersive, virtual environment incorporating visual, auditory, and other sensory elements enables interactive pedagogical approaches that would otherwise be too expensive, too dangerous, or too large to implement in a classroom setting, potentially offering transformative educational benefits to undergraduate engineering students.

The proposed will be staffed by undergraduate researchers from CBE and related disciplines and will harness the capabilities of both the Beta Classroom and the new RAVE laboratory in JEC 2317 to achieve the intended educational outcomes.

Incorporating Digital Simulation Tools in Teaching Manufacturing Topic in ENGR. 4710 & 4720 Manufacturing Processes (MPS) and Systems I & II Classes in the MILL

Prof. Matt Oelischlaeger, Jeff Morris, Ph.D., Larry O'IGny, and Sam Chiappone

Objective

- Enhance the MPS learning experience, and replicate industry standards, by incorporating self-paced online CAE digital simulation video exercises to augment hands-on lab exercises.
- A pedagogical shift allowing students to gain pre-lab knowledge through out-of-class digital simulation exercises on manufacturing topics related to in-class hands-on experiments.

Outcomes

- Develop student understanding of engineering theory, simulation, and prediction as they relate to manufacturing processes.
- Provide a foundation for the exploration of simulation in manufacturing.
- Replicate current industrial trends in CAE digital simulation systems.
- Deliver a consistent learning experience. Online digital simulation tools provide the same content and delivery method for all students ensuring consistency.
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Integrating Interactive Research and Visualization Tools into Building Science Curriculum
Gabrielle Brainard (ARCH), Maie-Ling Lokko (ARCH), Nina Sharifi (ARCH), Raquel Veelho (HASS)

This project aims to integrate experiential active and blended learning into introductory Building Science and Design courses, enabling students to discover links between data literacy, design and performance in the built environment. The major aspects of this project include:

- Active learning through hands-on study of energy and comfort phenomena within the built environment using sensor and data acquisition in 15th floor rooms and liquid crystal display (LCD) displays.
- Understanding material performance using LCDs in environmental testing chambers.

Interactive Visualization of Communications in Networked Programs to Enhance Student Learning and Aid Debugging
Barbara Cline, Stacy Patrickson, and Buster Holdtby
Department of Computer Science

The most important impact of Salomitti has been managing and maintaining the high academic computer network that has been integrated with the Computer Science I and Data Structures, even as our enrollment has fluctuated. We are interested in expanding these benefits to upper level courses, specifically the new networking programming assignments in courses such as networking basics, Network Programming, and Distributed Systems and Algorithms.

Blended learning through online data visualization and parametric analysis tools.

The Well-being Toolbox: interactive approaches with complementary use of technology
Alkaa Woy (Cognitive Science) & Tomie Harni (Arts)

Addressing stress and promoting well-being are critical concerns on college campuses. Change in RPI campus culture concerning issues of well-being is vital, but it cannot be accomplished from one office or individual. This project aims to start the conversation through an interdisciplinary, first year HSS course called Well-being: Cultivating Curiosity.

- To refine pedagogical innovations to support students’ development of a personal well-being toolbox.
- To pilot technological and data approaches that could be used in the classroom to foster awareness.
- To reach a larger population of students in our classes to focus on practice and science of well-being.

When writing networked programs, students contend with a variety of problems they may never have encountered before. Even basic setup, testing, input, and output for networked applications are difficult. Once written programs are networked, issues of concurrency including message loss, delay, and blocking can make it difficult to reason about inter-process states. Manual debugging is often not enough to identify the problem. To address these issues, we developed a new networked computer class that uses similar approaches to other computer science courses. It is the first to use interactive learning with a software tool called Gazebo, the first to use interactive learning with a software tool called Gazebo, and the first to use interactive learning with a software tool called Gazebo.

- Interactive Lecture Demos - Facilitates the interactive demonstrations.