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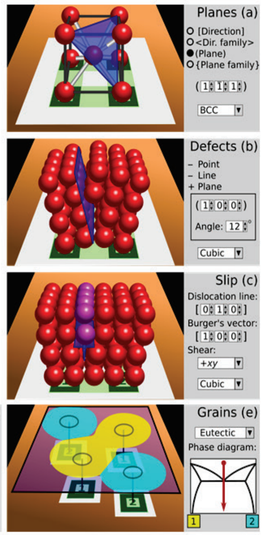
2018 Teaching and Learning Collaboratory (TLC) Seed Proposal Winners

Immersive experiments in the engineering classroom using Augmented Reality applications

Ravishankar Sundararaman, Chaitanya Ullal, Yunfeng Shi, Daniel Lewis (MSE)

- Combine augmented reality (AR) with real-time materials simulation to facilitate immersive in-class virtual experiments
- ENGR 1600 as an initial platform: develop five AR apps that address concepts that are most challenging to visualize
- Bridge AR apps with 3D printing to generate on-demand physical models eg. crystal structures that pair with AR content



The Blended Collaborative Classroom Approach to Teaching MANE 4080: Propulsion Systems

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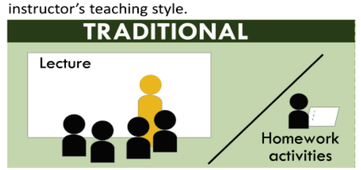
Rensselaer Polytechnic Institute

Objective

This project seeks to combine portions of the "flipped classroom," a collaborative learning approach, and portions of the traditional classroom approach that have been well-received by Rensselaer students. The goal is to utilize the Beta Classroom at Rensselaer to create a learning environment that enhances student comprehension in the field of aerospace propulsion systems.

Rationale For This Project

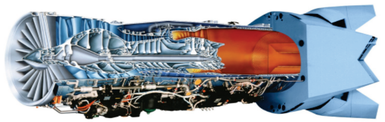
While the current approach to teaching propulsion systems at Rensselaer appears to be adequate for some students, the traditional model proves inadequate for visual and experiential learners, or students who benefit from a learning pace that is inconsistent with the instructor's teaching style.



In the traditional classroom format, the instructor's role is as a "sage on the stage." Image credit: The University of Washington Center for Teaching and Learning

Background & Motivation

- Propulsion Systems is a required course in the aeronautical engineering curriculum that is offered annually at Rensselaer's Troy campus. Topics covered in the class include analysis of thrust generation from propellers, gas turbine engines, and rockets.

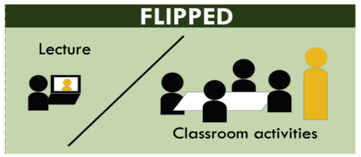


A cutaway of the F119-PW-100 turbofan engine. Image credit: United Technologies Corporation, Pratt & Whitney

- The flipped classroom approach has been shown to be more effective in achieving desired learning outcomes in engineering than the traditional teaching method.
- Collaborative, problem solving, and example-based methods are often effective in enhancing student comprehension in engineering.
- Since engineering is a collaborative discipline, encouraging collaboration among students while they learn helps prepare them to be leaders in their field upon graduation.

Goals Of The Project

- Online lecture videos and other media will be prepared and made available to students who elect to take MANE 4080 in the Beta Classroom.
- The Beta Classroom's AQUOS BOARD Interactive Display System will be used to present two- and three-dimensional animation and modeling of aircraft engines.
- During class time, students will be directed seek solutions to problems collaboratively, using the various collaboration technologies available in the Beta Classroom.
- The efficacy of the Blended Collaborative Classroom approach will be assessed by comparing student performance on quizzes and exams between the two cohorts.



In the flipped classroom format, the instructor's role is as a "guide on the side." Image credit: The University of Washington Center for Teaching and Learning

2018 Teaching and Learning Collaboratory (TLC) Seed Proposal Winners

DATA@Rensselaer

(J. Kuruzovich and D. Lewis)

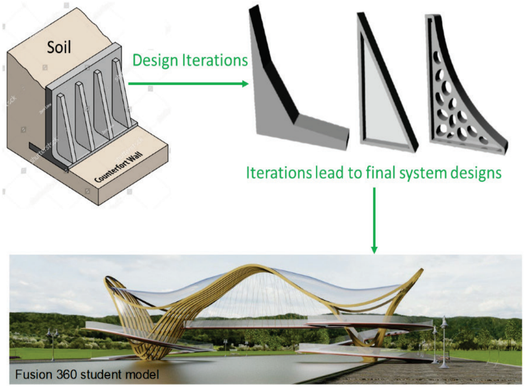
Increasing computational literacy and teaching data dexterity across the curriculum for students through curated instructor modules and computational infrastructure support.

Rensselaer

Revolutionizing civil and environmental engineers' introduction to the design process through immersive closed loop analysis, prototyping, and testing

Mohammed Alnaggar, Victoria Bennett, & Omar El-Shafee

This project plans to implement a Civil and Environmental Engineering (CEE) IED that fosters the development of engineering judgment through state of the art modeling tools in a collaborative and engaging environment, and by allowing students to build, test, and fail prototype designs, and learn from their failures.



Towards this goal, the following objectives are proposed:

- Implementing a mock course module.
- Implementing 3D modeling software models with multiple variations.
- 3D printing and testing of the selected prototypes.
- Video recording of the whole process to create tutorials on how to use all the involved technologies.

On-Line Mentoring for STEM Students (First Year and Beyond)

Gerald Korenowski (Chemistry) Alex Ma (Chemistry) Bruce Piper (Math) Peter Persans (Physics)

- Two-hour on line mentoring sessions for Calculus 1, Chemistry 1, and Physics 1 open to all students enrolled in these classes.
- Weekly sessions are conducted by specially trained I-Persist undergraduate mentors. Each content area is held in a separate two-hour block.
- Each session will consist of content related material and student success topics such as study skills, time management, coping with stress, and etc…

- Video conferencing tool such as Adobe Connect is used along with smart board technology in order to conduct real time, interactive on line mentoring sessions.
- Students can submit questions in real time either via typed messages in the chat room or through audio connection. Their anonymity can be maintained if they wish to do so.
- The mentoring sessions are accessed by the students from any location on or off campus using an internet connection.
- All the sessions are recorded and archived so the students have them available for future reference.