Multidisciplinary Simulation Based Learning Enhancement Module

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Abstract

Simulation based learning modules can be effectively introduced to a large audience with customization. The simulation modules can essentially engage learners from diverse background and efficiently introduce the quantitative approaches to non-engineers. Moreover, those can greatly help demonstrate the academic content to one's target audience through real world application.

As a part of efforts of incorporating simulation-based multidisciplinary learning enhancement in the universities in the US, an application of a food process based on the COMSOL Multiphysics® software was developed. The simulation was built for retort operation—based on a case study, with time dependent "Heat Transfer in Solids" physics interface for a 2D axisymmetric geometry of the tin in the COMSOL® software. The application was implemented at seven different universities across the US, either as a part of their existing course or as an extra-curricular activity. It allowed the student user to vary the dimensions of the tin (height and radius), heating time and temperature, and assess the effect on food safety (bacterial inactivation) and quality quantitatively. A questionnaire was developed to evaluate the performance of the users prior to application use and after its use.

The enhanced performance (19.61±9.10% of increase in the correct answers after simulation-based application use), and mixed feedback from the users as well as the course instructors across all seven universities, demonstrate the usefulness of the simulation application and indicate the challenges in its implementation. Main advantage of the active and student-centered simulation-based learning module was individualized pace and applicability to students of diverse backgrounds. It included the quantitative demonstration of academic content which may not be possible otherwise in the classroom or laboratory setting in short time.

Figures used in the abstract

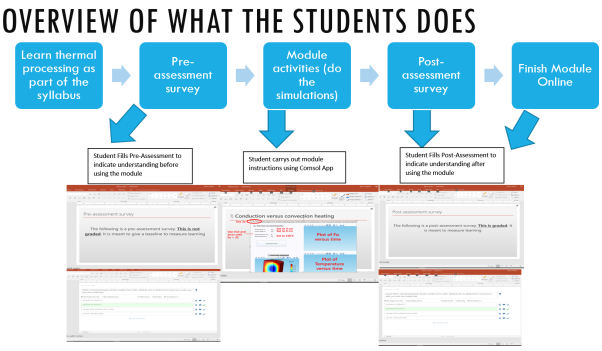

Figure 1: Overview of student activities in a module for simulation based learning enhancement