VPUE Curriculum Development Grant Proposal for Chemical Engineering 110: Equilibrium Thermodynamics

Professor: Zhenan Bao
Chemical Engineering

1. A brief description of the project and its potential impact on undergraduate education (please note if related to Stanford Challenge initiatives):

The Chemical Engineering department prides itself on the variety of subject matters included in its curriculum. Many of these core classes can be moderately difficult, but one of the more abstract subjects is thermodynamics, as taught in Chemical Engineering 110 (ChE 110). In this course, students are taught a variety of topics, ranging from energy conversion from heat to power, non-ideal gases and solutions, chemical reaction equilibria, and abstract concepts such as fugacity and activity coefficients.

For this reason, we would like to design a series of demonstrations to help students gain a better grasp on these difficult subjects and then incorporate this understanding in student hands-on group projects. For the core topics in the course, we would like to develop at least one or more in-class (or in-lab) experiments for each lecture. Also, the development assistant will help collect or create videos to demonstrate other experiments that may not be safe or simple enough to perform in front of the students. The students will be placed in six groups and each assigned a video project to illustrate a concept through a hands-on demonstration. They will be expected to record their project using a video camera or other portable devices. Students will be encouraged to make these video demonstrations/projects as entertaining and creative as they would like, as long as the project/experiment is completed.

2. Specific designation of the faculty member(s) charged to oversee the project

The development of this interactive component to ChE 110 will be overseen by Professor Zhenan Bao.

3. Endorsement of the department or program chair in the form of a brief letter or email attached to the proposal:
See attached letter.

4. An itemized budget. Eligible expenses include salaries, materials and supplies, course development assistance (please include benefits), course related (local) field trips. Equipment expenses are carefully reviewed and require substantial cost-sharing with the department:
   (a). A development assistant will be hired to create the specific videos, design the in-class demonstrations, and organize the detailed requires for the group projects. This assistant will be hired at the standard rate for equipment training of $25/hr, with a maximum of 6 hr/wk, paid from April 15 through the end of fiscal year 2011. Total: $5400 plus 8.3% benefit= $5848
   (b). Approximately $1000 will be used to pay for materials and supplies for developing the experiments and in-class demonstrations. These supplies include glassware, chemicals, bunsen burners, a hand-held pressure sensor, and an electronic thermometer. Total funding request: $6848

5. An implementation schedule and evaluation plan (e.g., student surveys, faculty peer review, etc.). [Note: A follow-up report is a grant requirement.]

We budgeted 36 weeks and 4 hours per week development assistant time. Fifteen lectures are given each quarter. On average, we expect 8 hours is needed per lecture to design and test the in-class or prepare the video demonstrations. For the six student projects, we will spend 4 hours (or one week) to design and testing out each student project.

The quality and value of these demonstrations/videos will be evaluated through mid-quarter evaluation and the end-quarter course evaluation. Additionally, we will invite CTL to conduct a in-class evaluation towards end of the quarter.