University of Michigan
Provost's Teaching Innovation Prize

2016 WINNER

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Identify-Solve-Broadcast Students' Own Mass and Heat Transport Phenomena

Innovation Description

Supporting students in the production of work that will be valued by real audiences, not just a grader, is a hallmark of innovative teaching. In 2012, Chemical Engineering 342 won a TIP award by challenging students to demonstrate heat and mass transfer principles for visiting high schoolers. In 2014, ChE342 students took demos of heat and mass transfer to the next level by creating YouTube videos, a multimedia assignment.

Students respond enthusiastically to meaningful opportunities for autonomy and creativity. Careful scaffolding of the video project process by the instructor can ensure that rigor is not lost in the fun. **Identify:** Groups first develop and defend a project proposal with an eye to scientific accuracy and feasibility. Notably, if a group chooses a very complex example of heat and mass transfer, the students may address just one or two key experimental parameters; this approach respects their intrinsic motivation while keeping projects manageable. **Solve:** Students design original experiments or simulations. When intuition conflicts with rational prediction, they build experimental systems, define relative parameters, and set up mathematical models. **Broadcast:** Groups meet regularly with the course instructor and GSIs as they figure out how to organize their demonstration into a clear and engaging video.

http://tinyurl.com/FeiWenTIP

Student Comments

"Working on the YouTube project increased my awareness of how the concepts of heat and mass transfer play a role in my daily life."

"It differs from traditional assignments and pushes us to relate conceptual knowledge to actual applications."

"Knowing that our videos would be uploaded online motivates us to create a video that is interesting and easily comprehensible for the public."

"I enjoyed the opportunity to collaborate with peers, to choose a real-world application that intrigued us, to be creative with our project delivery and experimental design, and to think analytically to solve non-textbook problems."

"The scope of the project was very broad, which resulted in a great variety of topics that delved into many daily observed phenomena and allowed us to reflect on the wide application of what we have learned in class."

"The project tested my ability to develop experimental designs, apply my understanding of heat transfer principles to model the results, and most importantly to comprehensibly describe my thought process to others."

Examples of Teaching Innovation

Video Grading Rubric

Each group must submit a 3-5 min video recording of a demonstration based on a heat or mass transfer principle. The purpose of this video is to disseminate your project to a broader audient via the Internet. Therefore, the video should clearly state:

- A daily life phenomenon that inspires and motivates the experiment
- The purpose and rationale of the experiment
- The design and execution of the experiment
- The explanation of mass/heat transfer principle underlying the experiment
- A brief summary of what is demonstrated
- How Chemical Engineers contribute to real world problem solving

Using a grading rubric helps ensure the quality of videos intended to play a role in global outreach. The YouTube channel has drawn 1,140 views from 68 countries as of February 2016.