Abstract & Introduction

Standard lecture-based educational approaches are of limited effectiveness in repair of students’ misconceptions as much as it does at improving students’ computational abilities. Educational efforts to improve conceptual learning using approaches such as inquiry-based activities have been effective, but have not been widely adopted by engineering educators. The goal of this work is three-fold: First, we will re-create our inquiry-based activities for heat transfer by specifically modifying them in ways that make them easier for faculty to implement in the classroom; Second, we will measure the effectiveness of these modified activities as they are implemented by our partner institutions; Third, we will provide both the full menu of activities and the effectiveness data to faculty broadly and monitor the adoption “in the wild”.

We have completed the first two years of this project. Based on faculty survey data, we have produced four new variations on the inquiry-based activities. These involve: a) replacing the students’ experiments with simulations; b) replacing the students’ experiments with the students observing the experiment as an in-class demonstration; c) the students’ watching the simulation as an in-class demonstration and d) replacing both simulation and experiment with an in-class thought experiment. These variations have been tested over the course of two academic years. The next step will be releasing the effectiveness data for these activities and tracking adoption and its relation to both effectiveness and time commitment.

Testing & Dissemination

- For each variation, we are assessing:
  - Faculty time
  - Faculty reaction
  - Required class time and perceived student reaction
  - Student learning gains (HECI concept inventory)
- Results and all variations will be available for download through the AIChE Concept Warehouse

Ongoing work

Teaching Heat Transfer in the 16-17 academic year?

Look for downloadable versions of each activity to be available through the Concept Warehouse, along with effectiveness and time information.

References


Acknowledgements

We gratefully acknowledge the support of the National Science Foundation (TUES2# 1225031) as well as the participation of our test site partners.