

“Flipped Classroom”: Flipping Heat Transfer to Increase Active Learning

Malancha Gupta

Introduction

The “Flipped Classroom” is a new form of teaching in which the students watch the lectures online before class and lecture time is devoted to group projects, problem solving, demonstrations, and other forms of active learning. Several studies have shown that students prefer flipped classrooms because they are more interactive and there is increased peer-to-peer learning. In addition, the professor is able to spend their time giving feedback and guiding discussion instead of covering material in a traditional lecture format.

Online Lectures:

Screencasts using a Tablet PC

Class Time:

a) Example Problems

b) Group Projects

i) Students explore examples of heat transfer in everyday scenarios

examples from students:

-cooking popcorn using oil (conduction), air popper (convection), microwave (radiation)

-cooking eggs with soft versus hard yolks

ii) Students investigate examples of heat transfer in current research fields

examples from students:

-countercurrent heat exchangers found in marine bird extremities

-heat transfer through aerogels

-heating of satellites due to radiation

c) Demonstrations

i) Students tour labs to see examples of heat transfer in research (chemical vapor deposition, optical sensors, etc.)

ii) Students develop demonstrations for heat transfer using everyday scenarios

examples from students:

-solar thermal heating of water

-heated honey flowing through a pipe

-embedding heat exchangers into clothing

d) Modeling

i) Students can use COMSOL Multiphysics software to examine three-dimensional heat transfer coupled with fluid flow

e) Exams

i) Midterm and final will be given during class time

Potential problems:

a) Will the students watch the online lectures before class?

b) How will teams be assigned ?

c) Is this new format beneficial for all students?