Ditch the Lecture So Students Will Learn
A CRLT Investigating Student Learning Project
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Background
The medieval practice of passive lecturing has dominated Engineering education despite numerous studies that suggest much more is learned if active methods are used. The study to the right may be the first direct measurement of brain activity during passive lecture compared to other typical student activities. These alone should worry anyone who is still practicing the time honored passive lecture style. This work is founded on decades of research, yet there is a clear need to hammer away at improving the classroom experience by eliminating passive lecture and replacing it with active learning experiences in class.

It is also interesting that watching television is right up there with attending passive lecture for brain activity. Hence, this work is NOT a typical flipped classroom, but rather an active learning replacement for lecture WITHOUT ANY screencasts or lecture recordings. The only video that is provided is inspirational video intended to convince students to spend the 10 hours or so that is needed to prepare for class.

Results:
Assessment of student performance as a function of pedagogy

The Course
MSE 220, Introduction to Materials and Manufacturing, F2012 - 177 students
Taught Monday, Wednesday, and Friday with a Recitation on Thursday

Experiment
Lecture as usual Mondays and Fridays
Replace lecture on Wednesdays with active learning sessions
Measure performance by tagging exam questions based on presentation style

The Normal Lecture
Visually rich, high signal to noise ratio slides
Demonstrations
In-class activities ~10% of lecture time

Resources for students
Pencast and PDF homework solutions
Lecture templates for optional study before and after class
Lecture capture of Monday and Friday lectures (Wednesday sessions were not provided)

Pre-work for Wednesdays
Online quiz based on book reading and an inspirational video to watch

In-class activities on Wednesdays
Guided inquiry homework, derivations and examples
Story boarding approaches to teaching concept to high school students
IF-AT questions (http://www.epsteineducation.com)
Use of Instructional Aides to help GSIs help students during class

Other Peer Learning Activities
Use of Piazza to write multiple choice and fill in the blank questions

Next steps
+ Completely eliminate lecture
+ Downplay exams by making them worth less than 25% of grade
+ Use a flat classroom with groups of 4 students
+ Assign individual homework for review and refinement in groups
+ Don’t grade homework but do grade reflection on homework
+ Expand use of Piazza type student interaction for reading the book (nb.mit.edu is an excellent option)
+ Add project based learning into the mix