Flipping Classrooms in the Swanson School of Engineering

presentation to the Board of Visitors Committee on Undergraduate Education
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Example of Flipped Classroom

- http://www.youtube.com/watch?v=2H4RkudFzlc
What is flipping?

- A pedagogical approach
- Lecture and out-of-class elements are *desrever* (reversed)
- Short video lectures are viewed by students at home *before* the class session
- In-class time is devoted to true *engaged* learning
How does it work?

Out-of-class

- Students view multiple videos
  - 4-6 mini-lectures (~10 min each)
  - Units or themes
  - Online quizzes/activities interspersed
    - Low stakes
    - Immediate feedback to students
    - Re-watch lectures to clarify points of confusion

- Video
  - Instructors develop themselves
  - Videos by notable experts - MOOCs
  - Podcasts/ItunesU/YouTube
How does it work?

*In-class – the instructor*

- Function of in-class “instruction”
  - Coach and advise via activities
  - Encourage and challenge individual inquiry and collaborative effort
- Activities
  - Lead in-class discussions
  - Turn the classroom into a studio
  - Suggest approaches, clarify content, and monitor progress
  - Organize students into groups to solve a large open-ended problem
How does it work?

*In-class – the student*

- Students can inquire about lecture content
- Test their skills in applying knowledge
- Interact with one another in hands-on activities
Why do this?

• **Application** of concepts
  – Can detect errors in thinking
  – Cover material in a deeper fashion
  – Introduce *meaningful* and *active* learning

• Responsibility of learning on student
  – They *cannot be passive* learners!
  – *Engagement* in learning
Who’s flipping?

• Not really new
  – Recent interest in engineering
  – Erik Mazur – Harvard Physics
  – Technology makes this so easy now!

• NAE Frontiers of Engineering Education
  – 2011: 0 flipping innovations
  – 2012: 9 flipping innovations

• *Flip your classroom – Reach every student in every class every day* (2012)
  – By Bergman and Sams
  – Same persons in YouTube video
Challenges

• First time takes time!
  – Creating lecture videos is actually the easy part
  – Restructuring in-classroom time can be intimidating to faculty

• Students can resist
  – Some want to be passive!
Why are we flipping?

• Higher quality of education delivered
  – Nature of instruction is no longer to disperse knowledge
  – Information age provides full access to knowledge
  – This instruction model helps students integrate and apply knowledge
  – *Chronicle of Higher Ed* example (next slide)

• Capacity issues
  – 3 hr credits
    • 1.5 hrs out-of-class video/challenges
    • 1.5 hrs in-class meaningful learning
• San Jose State U. Says Replacing Live Lectures With Videos Increased Test Scores

• “Engineering Electronics and Circuits – one of the most-hated courses in the college”

• “40% of students receive a C or lower”

• Spring 2012 professors went to MIT to work with the edX (a MOOC) team

• 85 students in the flipped sections watch the edX lecture videos at home
• Attend class 2 times per week to practice what they learned and ask questions

• Fall 2012 mid-term exams in flipped sections were 10-11 points higher than traditional sections!
Flipping Instruction Grants 2012-13 Pilot Year

- $15,000 per faculty

- Refine core engineering course
  - Implement 2013-14
  - Maintained thereafter as a flipped model

- Full-time faculty within the SSoE

- Submissions due November 9; Awards made by December 1
Flipping Instruction Grants 2012-13 Pilot Year

- EERC provide staff consultation and assistance
  - Video and editing capabilities of out-of-class lectures, and
  - Pedagogy and technology instructional needs for in-class experiences.
  - Assessment and Evaluation