ADAPTING MOOC CONTENT TO FIT STUDENTS’ NEEDS IN FACE-TO-FACE CLASSES

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FLIPPING THE MOOC AT GEORGIA TECH

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When I say

MOOC

what's the first word or phrase that comes to mind?

MOOCS CAN BE & MOOCS CAN HAVE

FLIPPING THE MOOC - AGENDA

1. Flipped learning at Georgia Tech
2. MOOCs at Georgia Tech
3. Flipping the MOOC

FLIPPED LEARNING AT GEORGIA TECH

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WHAT IS FLIPPED LEARNING?

Simple version: lectures as homework, problem-solving in class

Syllabus instruction to students:

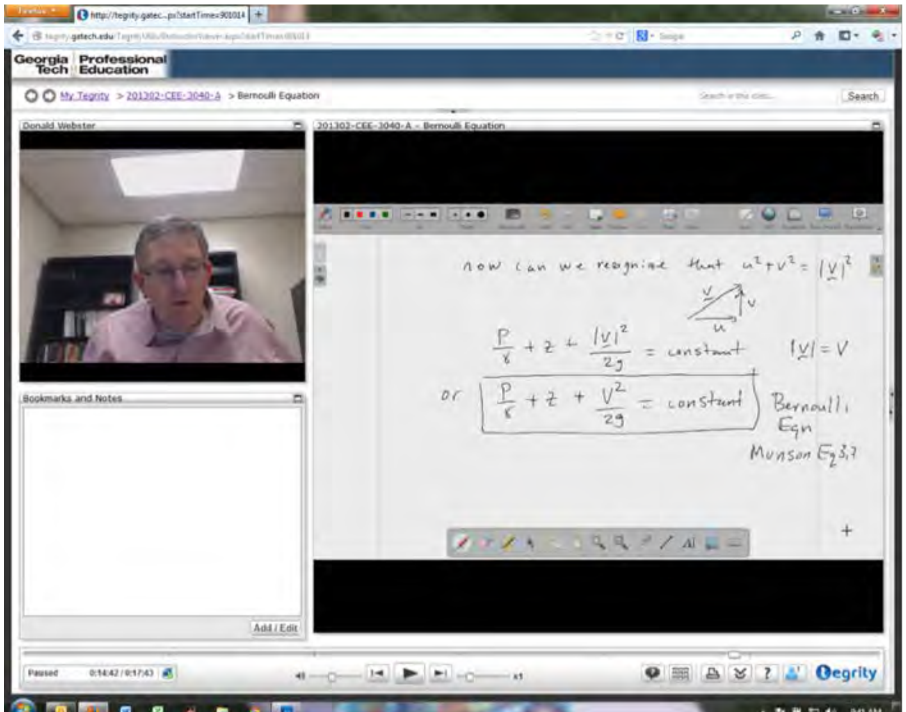
18	M Feb 18	In Advance: Tegrity lecture "Pressure Variation in Fluids in Motion" In Textbook: Chapter 3.1-2 In Class: Problem Solving - Euler Equation
19	W Feb 20	In Advance: Tegrity lecture "Bernoulli Equation" In Textbook: Chapter 3.2, 3.4-6, 3.8 In Class: Problem solving - Bernoulli Equation WileyPlus Assignment due: Quiz#5: 5.6, 5.7, 5.19, 5.20, 5.25
20	F Feb 22	In Class: Problem Solving - Bernoulli Equation
21	M Feb 25	In Advance: Tegrity lecture "Pressure Coefficient" In Class: Problem Solving - Bernoulli Equation

Lecture sequence (typical):

29 Pressure Variation in Fluids in Motion - Euler Equation (15:22)
30 Pressure Variation in Fluids in Motion Example 1 – Constant Pressure Lines (8:16)
31 Pressure Variation in Fluids in Motion Example 2 – Nozzle Flow (8:42)
32 Bernoulli Equation (17:43)
33 Bernoulli Equation - Definition of Pressure Terms (8:47)
34 Bernoulli Equation Example 1 – Converging Nozzle (8:01)
35 Bernoulli Equation Example 2 – Pitot Static Tube (6:26)
36 Bernoulli Equation Example 3 – Duct and Manometer (8:05)
37 Pressure Coefficient (10:24)

ONLINE (TEGRITY) LECTURE VIDEOS

- Prior to class meeting, students watch short (~11 minutes) video modules of lecture content and examples



72 video modules:

Average = 11.6 minutes
Std Dev = 4 minutes
Min = 5.3 minutes
Max = 21.07 minutes

Open Sankoré : The Free Interactive Whiteboard Software

Slide courtesy of Dr. Donald Webster

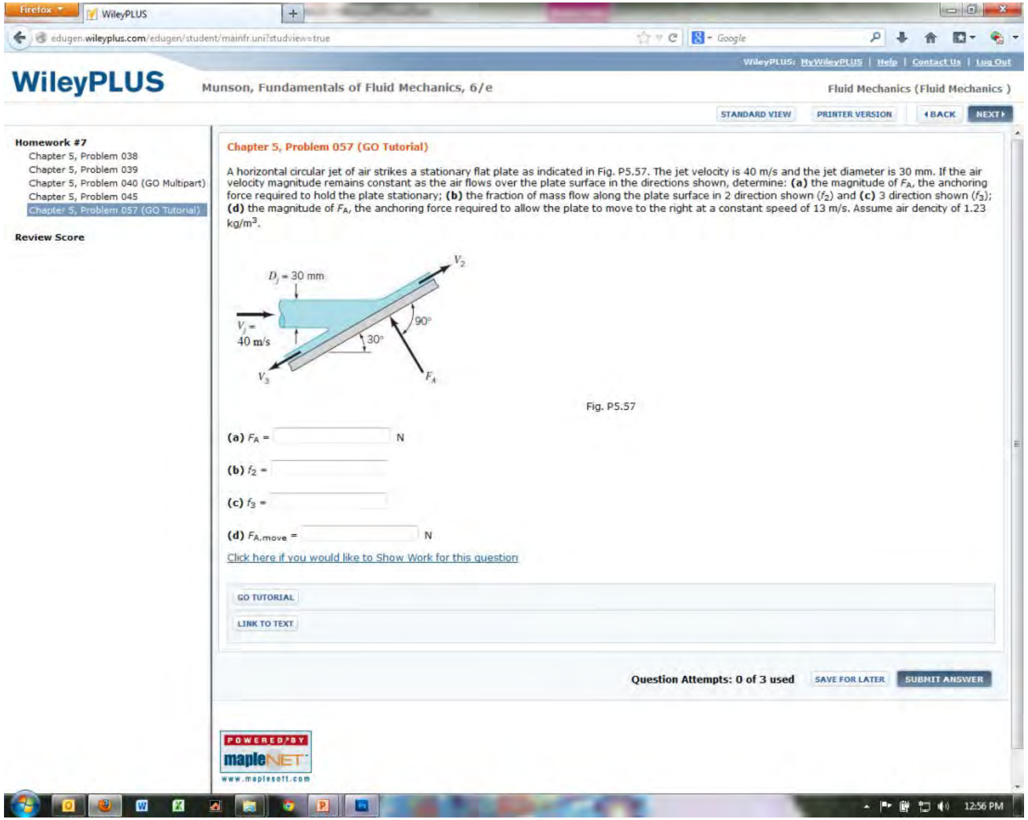
IN-CLASS PROBLEM SOLVING

- During class meeting, students work in **pairs** on problem solving – no credit, just learning
- 3 to 4 homework- or exam-style problems are offered during each 50-minute session
- Students pairs work collaboratively on 32” x 21” (81 x 53 cm) personal whiteboards
- Instructor and TAs are in the room to act as “tutors” for the teams

Slide courtesy of Dr. Donald Webster

ONLINE (WILEYPLUS) QUIZZES

- Students are assigned Quiz problems (5) each week
- The system is online with <u>different input parameters</u> for each student so they cannot blatantly copy solutions
- Students have 3 "attempts" with ±2% tolerance
- The online Quiz provides them with <u>immediate feedback</u> and students can "close the loop" on their mistake while it is fresh in their mind



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MOOCS AT GEORGIA TECH

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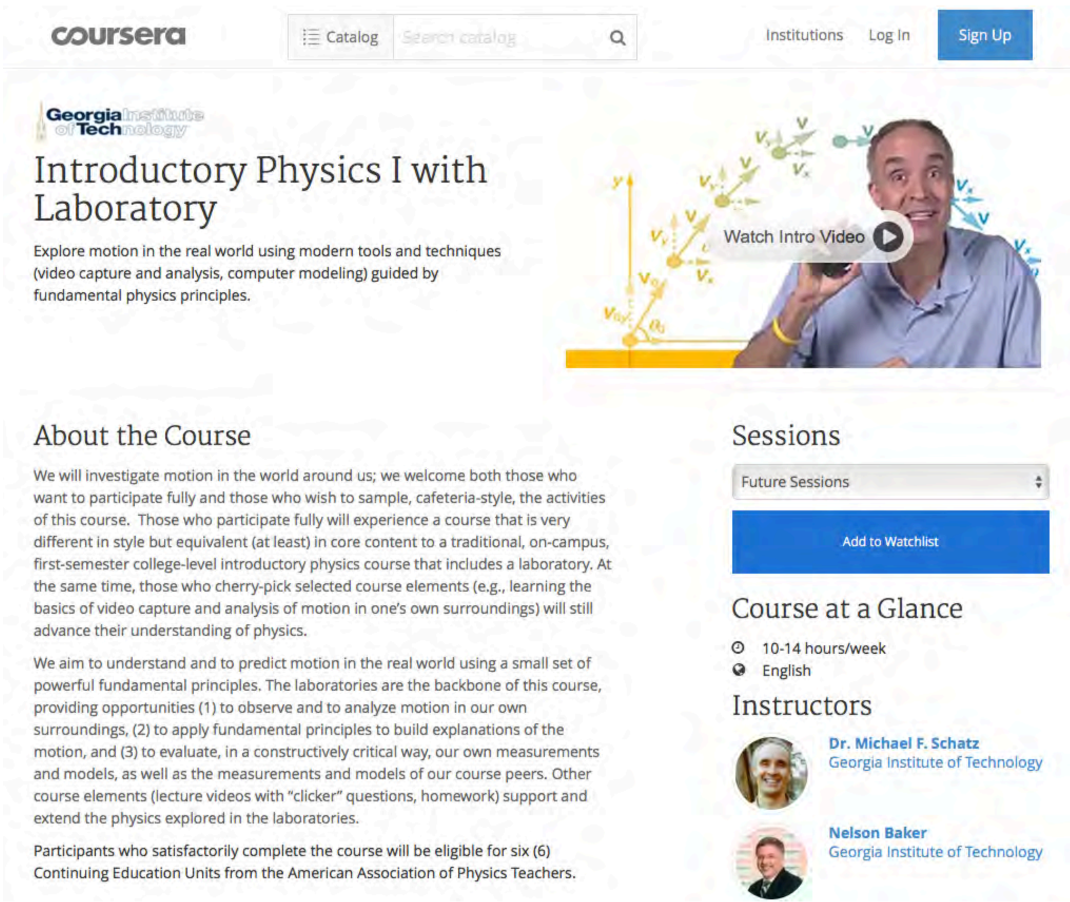
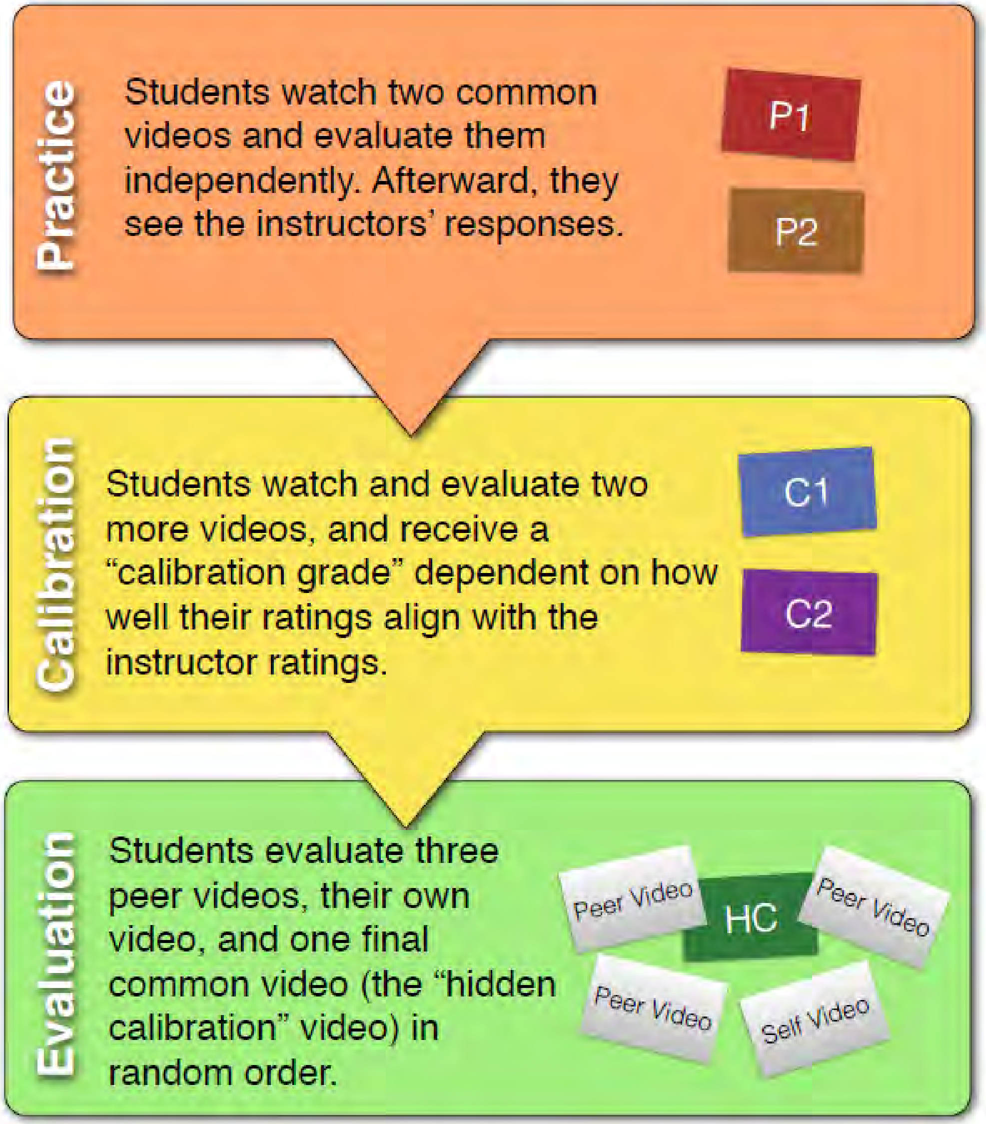
GEORGIA TECH MOOCS

Since July 2012, Georgia Tech has developed more than 30 MOOCs in partnership with Coursera—including courses in Engineering, Computing, English and Physics.

New partnership with edX in 2016 called GTx!



Statistically Weighted Aggregate Peer Review (SWAPR)



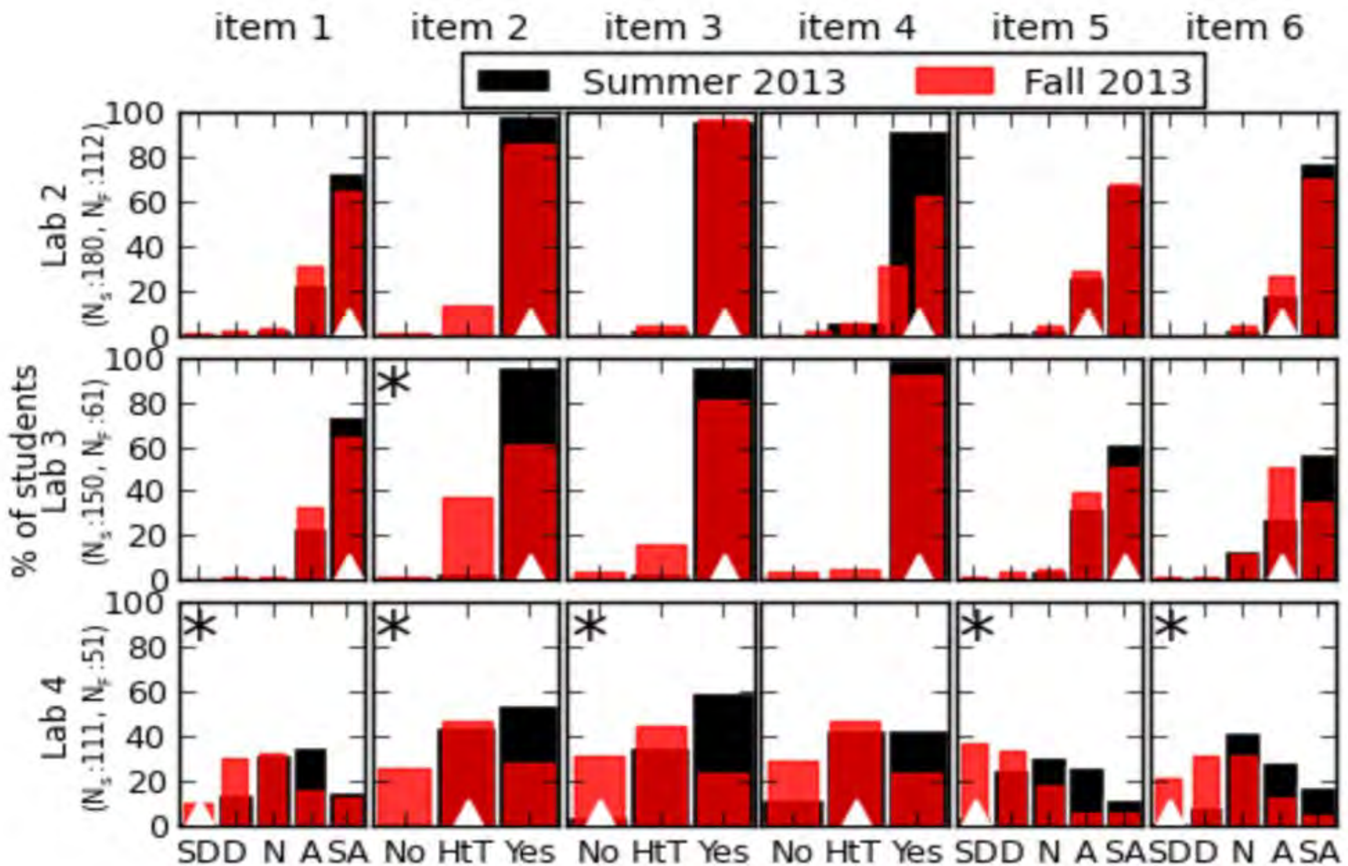
Slide courtesy of Dr. Michael Schatz

EVALUATION RUBRIC

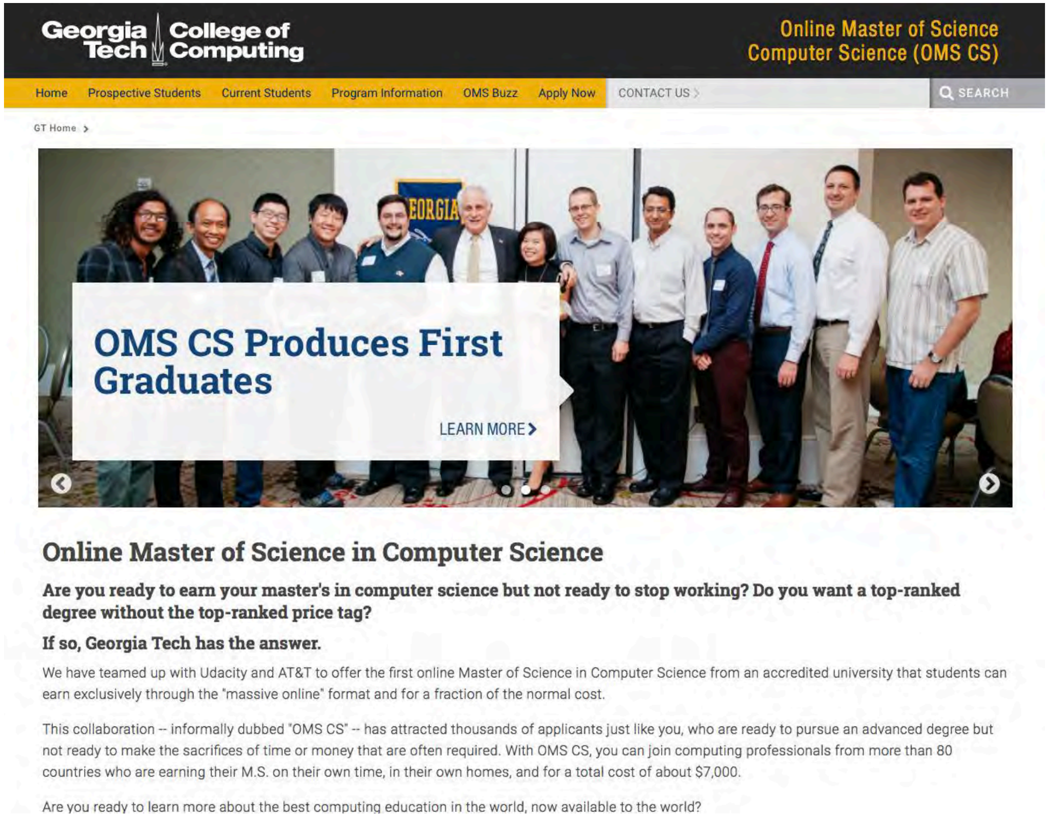
Item #	Item description	Grading options (and the corresponding point value)
1	**The video presentation is clear and easy to follow.** (Explanation: With this rubric question, feel free to criticize presentation, word usage, the quality of the video footage, and other features related to production value. After this question, please push production quality out of your mind and focus only on the topic the question is trying to probe.)	o **Strongly Agree** (12) o **Agree** (10) o **Neutral** (6) o **Disagree** (2) o **Strongly Disagree** (0)
2	**Does the video introduce the problem and state the main result?** (Explanation: Good introductions include a brief statement of the problem that's being addressed and the main punchline of the work that was done.)	o **Yes** (12) o **Hard to Tell** (6) o **No** (0)
3	**Does the video identify the model(s) relevant to this physical system?** (Explanation: Identifying the model(s) includes discussion of the main physics ideas (e.g., the momentum principle, curving motion), and how those ideas are applied in the problem under study.)	o **Yes** (12) o **Hard to Tell** (6) o **No** (0)
4	**The computational model(s) successfully predicts the motion of the object observed.*** (Explanation: When the computational model output and the observational data are plotted on the same graph, they match well with each other.)	o **Yes** (2) o **Hard to Tell** (1) o **No** (0)
5	**The presenter successfully discusses how his/her computational model(s) predicts or fails to predict the motion of the object.** (Explanation: The data used to initialize the model(s) are clearly identified. The parameters in the model that are adjusted to fit the data are clearly discussed. The places where the model fits the data well and where the model fits poorly are indicated.)	**Strongly Agree** (12) to **Strongly Disagree** (0) (Same as item 1)
6	**The video presentation correctly explains the physics.** (Explanation: With this rubric question, express your overall impression of how well the fundamental physics principles are connected to the motion under study)	**Strongly Agree** (12) to **Strongly Disagree** (0) (Same as item 1)
*: In lab 3, item 4 is slightly changed to "The computational model(s) successfully predicts the mass of the black hole" to fit the purpose of the lab. All the other rubric items remain the same throughout all 4 labs.		

STUDENT RATINGS

Student ratings of videos were closer to instructor's ratings after introducing the calibration videos.



GEORGIA TECH'S MOOC STRATEGY



- Offer to everyone, free of charge
- Offer certificates for a nominal fee (via Coursera and edX)
- Build successful degree programs
  - Online Master of Science in Computer Science
- Repurpose MOOC content and tools for on-campus courses
  - Small Private Online Courses (SPOCs)
  - SWAPR for peer review
  - Videos in flipped classrooms

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FLIPPING THE MOOC: LINEAR CIRCUITS AND INTRO TO ELECTRONICS

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PEDAGOGICAL OBJECTIVES

1) Improve consistency in quality and coverage in multi-section classes
    - 13 sections, 600 circuits students this semester
2) Increase student understanding and induce higher-level thinking through active and collaborative learning and hands-on activities

Slide courtesy of Dr. Bonnie Ferri

Linear Circuits

Bonnie Ferri
Bruno Frazier
Nathan Parrish

MOOC Statistics

- 58,300 students enrolled in four offerings
- Over 737,000 lectures viewed
- Over 633,000 problems submitted

Courses Supported

- ECE 2040 (180 students/term)
- ECE 3710 (450 students/term)

Introduction to Electronics

Bonnie Ferri
Allen Robinson

MOOC Statistics

- 45,000 students enrolled in two offerings
- 193,000 videos watched and
- 106,000 problems submitted in first offering

Courses Supported

- ECE 2040
- ECE 3710
- ECE 3741

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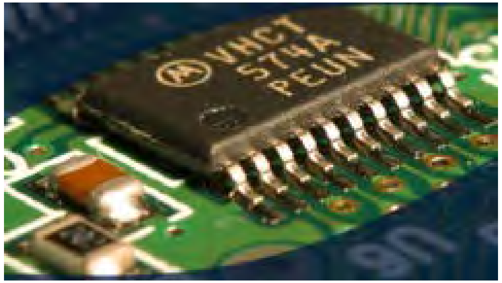
GEORGIA TECH: ONLINE COMPONENT

Video lectures

Videos of sample worked problems

Homework (graded automatically)

Piazza discussion forum



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GEORGIA TECH: IN-CLASS COMPONENT

Two-Minute Quiz on Lecture Material

Supplemental lectures giving depth or extra worked problems

Q&A

Worksheets on complex material

Hands-On Activities

- Minilabs completed during class time

Slide courtesy of Dr. Bonnie Ferri

RESULTS: ECE3710 – CIRCUITS AND ELECTRONICS

450 students/term in 9 sections

Old Format	Current Format
• Incomplete coverage • Mismatch in coverage of 25% • Curves on grades	• 100% coverage of syllabus • Common homework and tests, no curve on grades
GPA: 2.5 – 3.7	GPA: 2.9 - 3.1
No in-class labs	6 in-class labs

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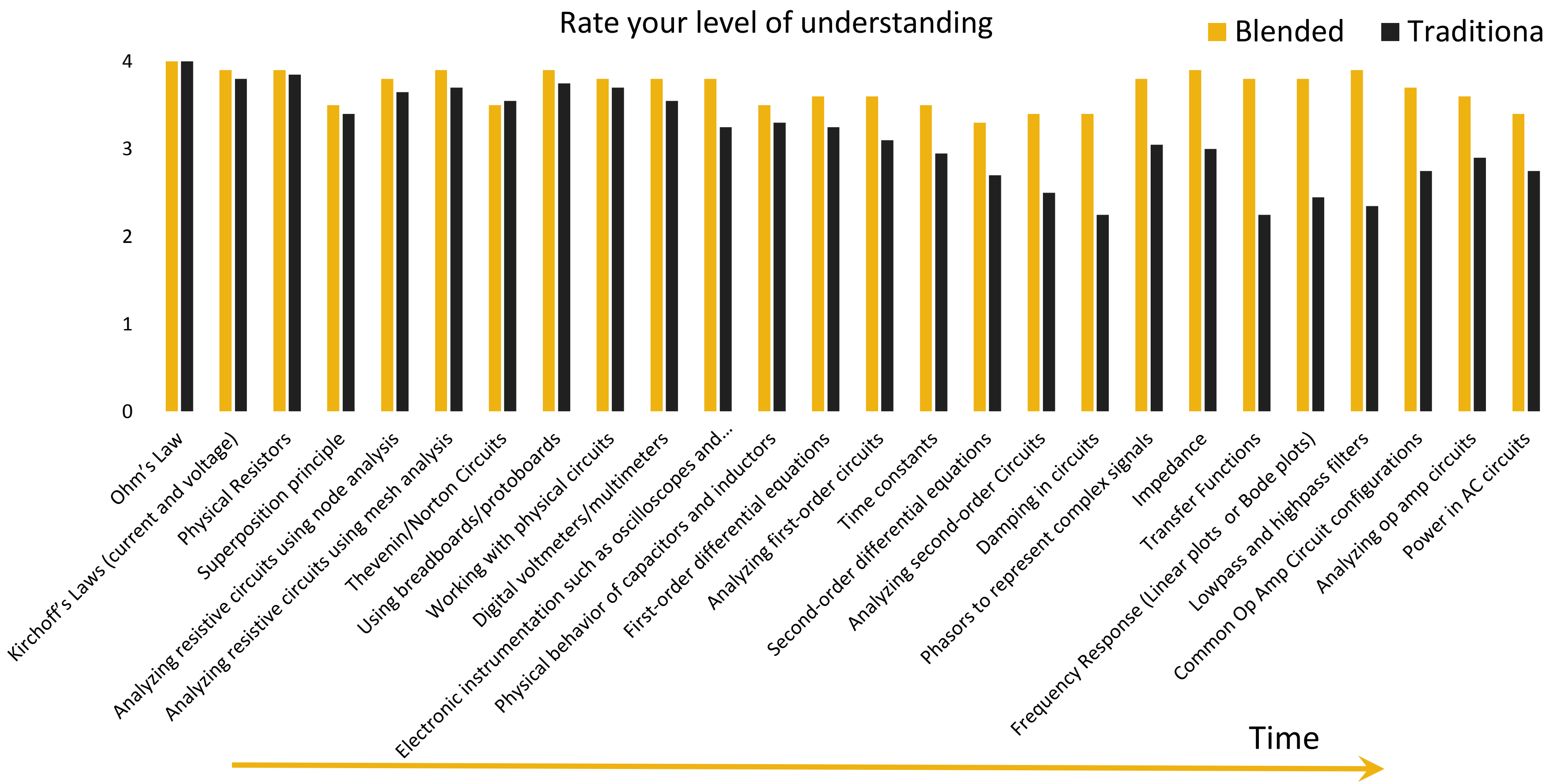
RESULTS: ECE2040 – CIRCUIT ANALYSIS



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WRAPPING UP

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WHY INVEST IN MOOCS?

MOOCs are tools to share information and learning globally, creating a community of learners.

- Investments
  - Sound instructional design
  - Produce high-quality videos and simulations
  - Develop assessments and peer-review strategies
- Benefits
  - Videos and sims can be used on campus
  - More easily automate grading
  - Increase institution's visibility

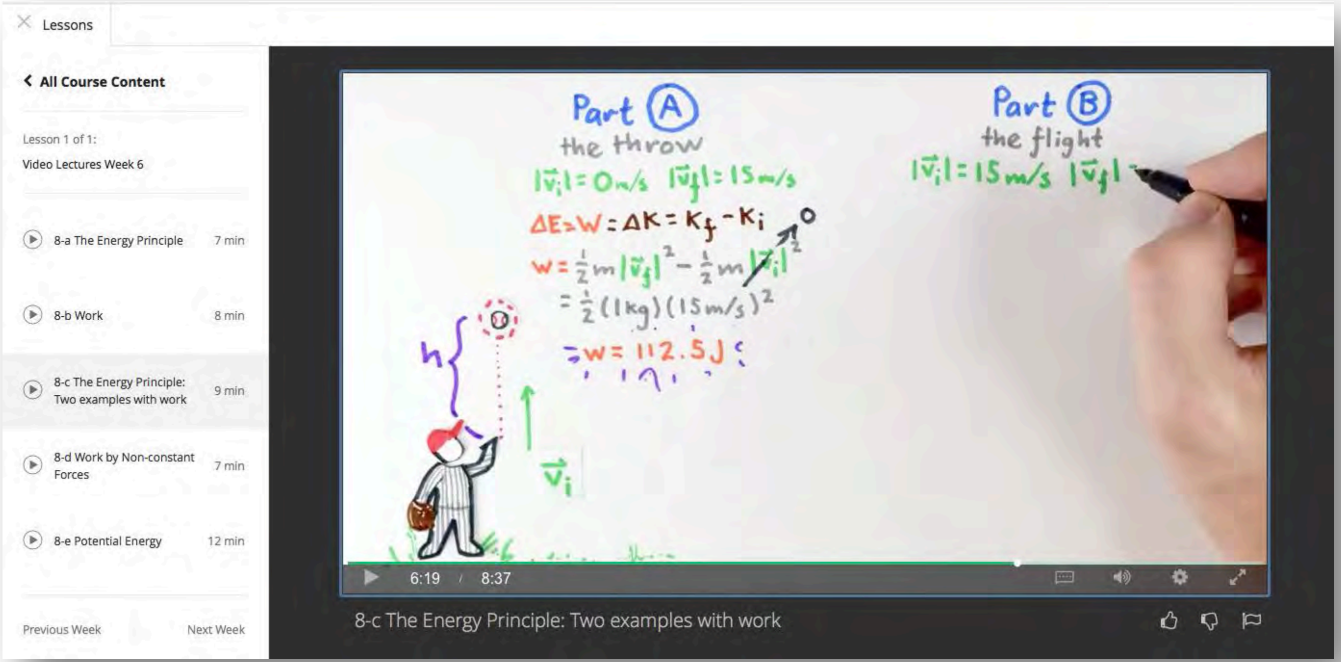
WHY USE A FLIPPED MODEL?

Flipped learning offloads the standard lecture to out-of-class time, in short, manageable chunks, saving class time for collaborative, problem-based learning.

- Investments
  - Video recording of lecture material
  - Create dynamic in-class problems
  - Instructor and TA “tutoring” in class
- Benefits
  - Engage students’ higher-order thinking skills
  - Learners review videos and revise problems
  - Experiences consistent with the beyond-school

WHY FLIP THE MOOC?

Best of both worlds: draw on standardized, widely-distributed learning resources while encouraging collaborative, hands-on problem solving…



…and use resources and tools from one to inform the other.

THANK YOU!

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