MIT Council on Education Technology (MITCET): Modularized Online Experiments

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—Supported by the Class of '60

MIT Residential Education (Mr 2012)

- Goal: To enhance the MIT residential educational experience through the development and use of new technology-enabled and online pedagogies.

Opportunities….

- Increase faculty-student and peer F2F interactions
- Enable personalized learning in pace, content and geography
- Support data-informed, dynamic teaching
- Accommodate different learning styles and levels of preparation
- Create new "hands-on" learning experiences
- Facilitate global exposure
- Increase depth of understanding, context and efficiency of learning
- Develop transferable skills; e.g. collaboration, communication, problem-solving, creativity, etc.

How?

Community
social, cultural, professional, personal

Research
UROP, MISTI, SMART, thesis

mens et manus

Academics

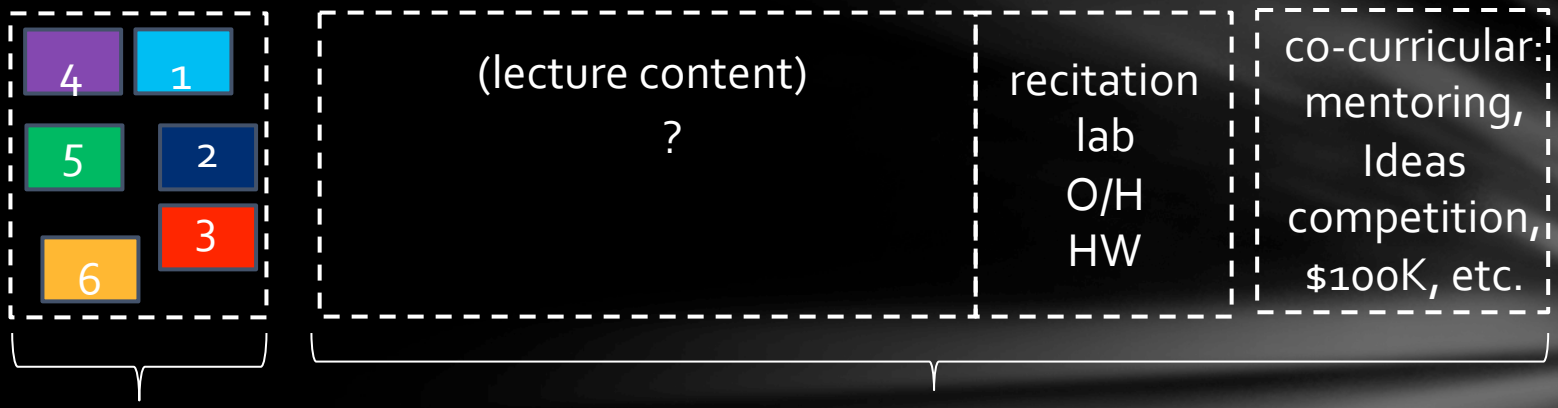
lectures, recitations, labs, O/H

1 2 3 4 5 6

co-curricular: mentoring, Ideas competition, $100K, etc.

MITCET Experiments: MITr future educational state

Modularized Online Curricula; Break up and move content into online concept "nuggets"



Potential Online Innovations

- Personalized content, pace, geography
- Connect modules to each other, to those in other courses and disciplines
- Diversity of formats; KSVs, discussion groups, intelligent tutors, interactive texts, podcasts, etc.
- Embedded assessments

Etc....

Potential F2F Innovations:

- Redefine the lecture; data-informed, targeted distributed mini-lectures
- Flipping: move HW to classroom, expand recitation, lab/demos, O/H
- Open-ended, independent project and team-based activities
- Integration of co-curricular, research (discovery-based) and community into classroom learning

Etc.....

→New forms of Teaching and Learning Spaces

Knowledge Acquisition→ Use → Generation

MITCET Experiment #1: Aeronautics and Astronautics

Inverted Classroom Model with Option for Remote Participation

Undergraduate Junior Year Electives:
16.20 Structural Mechanics and 16.90 (Computational Methods in Aerospace Engineering)

O/L "Look Ahead"

- Modularized O/L lecture content with embedded assessments (graded)
- Expectation for independent study and preparation
- Enables self-pacing, focus, reflection and reading in a meaningful manner

Interactive Class: F2F or O/L

- Anyone can participate remotely
- Focused, on-demand mini-lectures
- Small group problem-solving and discussion of concepts (participation grade)
- The format has *"knocked down barriers, if I'm not getting this or I'm not following that, I can just ask."*
- Report-out communication
- Recorded, whiteboard capture

"Look Behind"

- PSETs to test improved understanding after class
- Mud cards
- Review O/L content

Real-time data / feedback informs class

Based on the mid-term evaluation, the overwhelming majority of students reported a neutral or better opinion of the new format compared with traditional model.

D. Darmofal, R. Radovitzky, Q. Wang, & K. Willcox , Douglas Allaire (Aero-Astro), Glenda Stump (TLL)

MITCET Experiment #2: Mechanical Engineering

Core Undergraduate Class Mechanics of Materials II : 2.002 (F2F) - 58 Students + i2.002 (O/L) - 6 students

i2.002 :

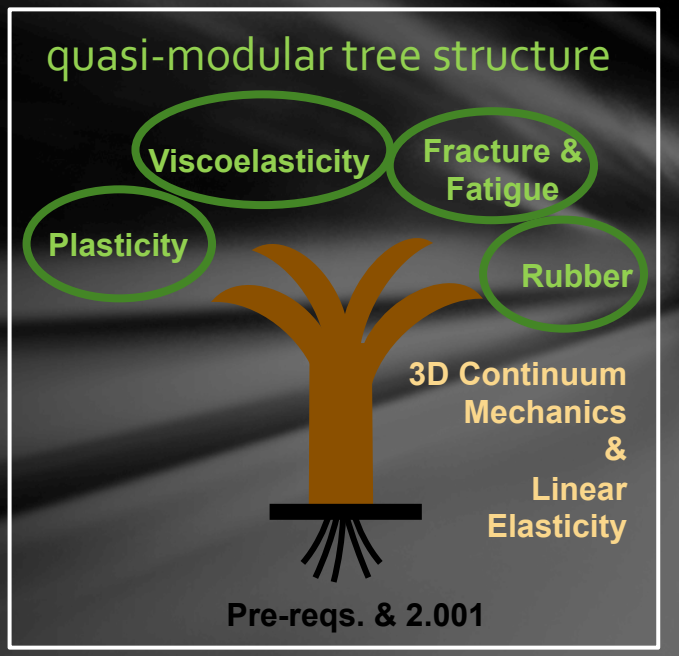
@way
- 2 students semester abroad (Spain)
- 1 student Olympic training (Puerto Rico)
- 1 student medical treatment (CA)

@MIT
- 3 on-campus students w/ schedule conflicts

Class : Lectures, Recitations (Videos TechTV, annotating, access, whiteboard recording, demos)

Support: Dedicated O/L instructor (O/H, proctor, etc.) Discussion O/L and F2F together (Piazza, 133 Q, 447 contributions)

Problem Sets and Labs: (Due dates, submitting); O/L Exam Proctoring (WebEx observation)



	P-set Avg	Exam 1 Avg	Exam 2 Avg
F2F (58)	83.1%	61.1%	62.7%
O/L (6)	84.5%	63.9%	68.8%

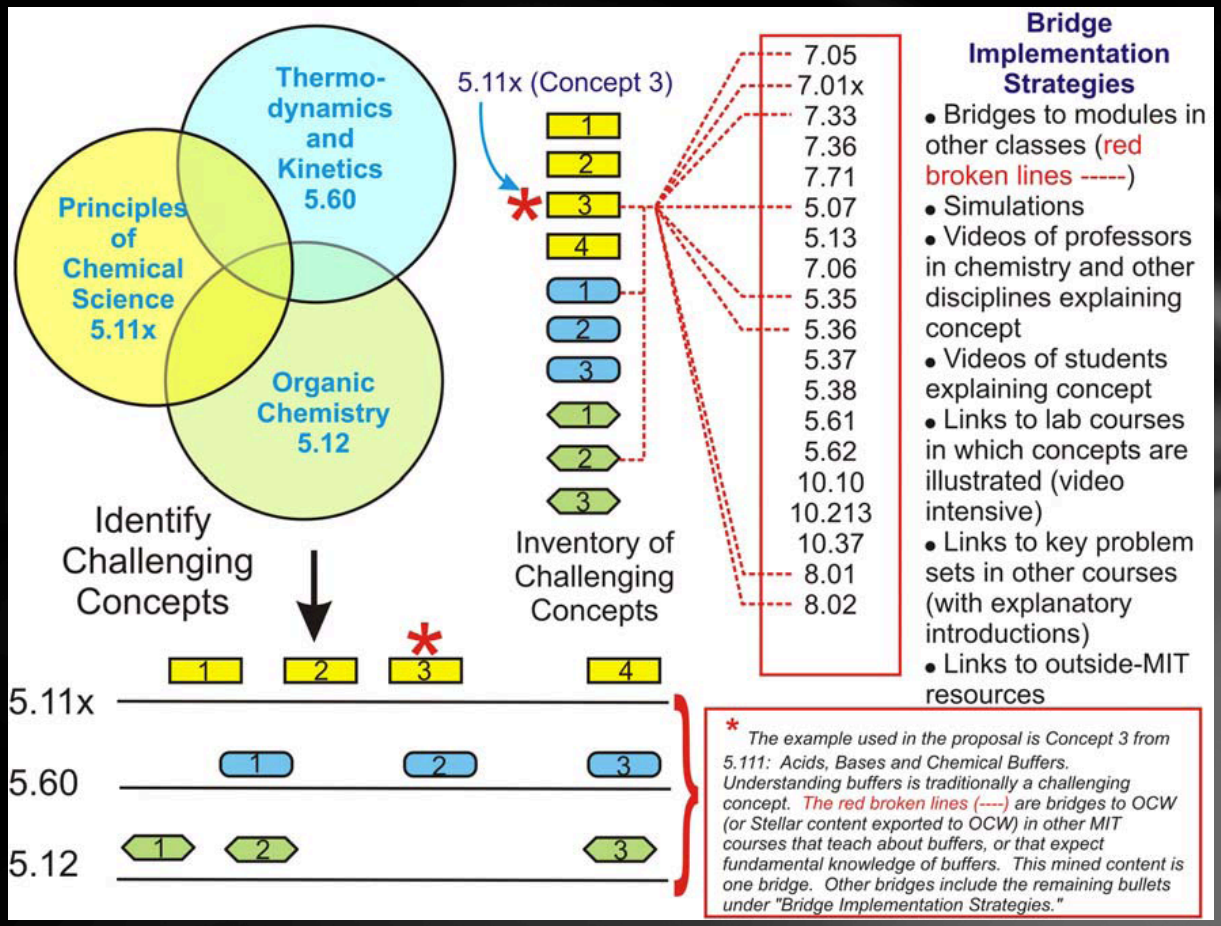
Ken Kamrin, Pedro Reis (Lecturers) Mary Boyce, Gareth McKinley, Amin Ajdari, Brandon Muramatsu (OEIT), Shenggiang Cai (Lab), Yang Shao Horn (Lab), Jared Drewniak (AMPS), Pierce Hayward (Video Lab), Adam Traina, Chris Dimitriou (TAs), Glenda Stump (TLL)

MITCET Experiment #3: Chemistry Bridge Project

Create modules on challenging, fundamental concepts that bridge numerous classes and disciplines to make learning more efficient and deeper:

- Acids, bases and buffers
- Electrochemistry and redox
- Quantum mechanics

- Mine web and create a multimedia database of educational resources for each concept
- Pre-assessment → create and implement personalized path through module → post-test



Step 1: The Meaning of the Equillibrium Constant, http://employees.oneonta.edu/viningwj/sims/equilibrium_constant_s.html
Step 2: Le Chatelier's Principle of Exam Stress, http://www.flickr.com/photos/mobsk128/6764849353/
Step 3: Le Chatelier's Principle, http://www.youtube.com/watch?v=uBrX4AgSyyo
Step 4: Strong and Weak Acid-Base Problems, http://web.me.com/dbyrum/Ris/APChmLecS2/AcidBase_ICETables.pdf

John Essigman, JoAnne Stubbe, Rick Danheiser, Troy Van Voorhis, George Zaidan, Melinda Cerny