Contemporary Educational Technologies: A Perspective from MIT

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Contemporary EdTech Agenda

- **Part 1: Introduction**
- **Part 2: Setting the Stage**
  - Global drivers, EdTech Strategy at MIT, your experiences
- **Break**
- **Part 3: EdTech Strategy at MIT and Highlights**
  - Remote Labs
  - Active and Blended Learning
  - Visualizations and Simulations
- **Lunch**

Contemporary EdTech Agenda (cont.)

- **Part 4: Activity**
- **Part 5: Highlights of Contemporary Practices, cont.**
  - Modularity
  - MOOCs
- **Break**
- **Part 6: Final Activity**
- **Wrap-up and Discussion**

Part 1: Introductions

Vijay's Background

- **B.Tech. in Chemical Engineering, M.S. in Industrial Management & Ed.D. in Future Studies in Education**
- **Taught courses in Instructional Computing, Educational Planning, Teacher Education**
- **30+ years in EdTech – Developing, Managing, Innovating educational uses of Information Technologies**
  - 10+ years in Open Education: Open Educational Resources and OpenCourseWare

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Brandon's Background

- **B.S. & M.S. in Mechanical Engineering**
- **Taught multimedia design and open education**
- **20 years in EdTech**
  - ~10 years in educational digital libraries: Collections, nationwide collaborations, quality and peer review
  - 9+ years in Open Education: Open Educational Resources and OpenCourseWare
- **"Been There, Done That"**
  - Multimedia courseware design and course support, course design, video production software design, digital libraries, metadata, learning objects, open educational resources/OpenCourseWare, …

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About you!

- **Please introduce yourselves with your Name and Institution**
- **What do you hope to get out of the workshop?**

Participants' Interests

- Different technologies used to improve education
- Role in the quality of education
- Broaden understanding, what's being used
- Learn how to create education technology, improve learning tools
- How students can do something special with technology in learning
- Technology to fill the gap with student preparation
- See examples to meet the challenge of global
- How to use for teacher education
- Teaching using educational technology both inline and offline
- See what are the possibilities for new teacher education programs
- See how to use Open Educational Resources, particularly for teacher education, see practices from MIT

Participants' Interests

- Technology models for programs
- Using in face-to-face learning
- Interested in online especially
- How to use different modes of technology in the classroom
- Learning technologies for online teacher education, distance learning
- Online resources for teaching
- How are technologies effective, and how to utilize in education
- Have perceptions challenged
- Learn modern trends, and how to effectively use them
- Learn what's next…
- Introduce text-based content into video
- When to use animations, graphics
- Differences, strengths of dissemination modes

Participants' Interests

- How to include OERs and MOOCs in teaching
- How to use in teaching practices
- How to use in traditional modes of teaching, esp. teacher education
- Insight into students and how they view technology
- What learning resources are available
- What LMS/VLE are available and how they might be used
- See the possibilities of integrating ICT
- Especially in the tribal and rural areas
- Lots of resources that can be shared – what are new areas to help others implement
- Learn the current practices and trends
- How to use in K12/school level

What does Education Technology mean?

- **Discussion**
  - Use of technology in education
  - Anything used to make education effective
  - Computer, multimedia
  - Projected vs. non-projected
- **Three areas mentioned:**
  - Educational Technology
  - Learning Models
  - Instructional design models
- **Mixture of terms used**
  - Technology in education
  - Education technology (more than ICT, whiteboard, paper, etc.)

Synthesis of Participants' Interests

- **Learn about technology and how to improve learning in the classroom, in online education**
  - Can we use similar, or the same, technologies in both?
  - How can we combine online and in-person at the same time? Blended Learning, Flipped Classrooms, All Online
  - How can we leverage people and communities online?
- **Specific considerations to consider?**
  - Infrastructure, tribal/rural areas vs. urban settings
  - Are there more things we need to think about? Preparation of faculty and students.

Goals and Objectives

- **Gain an understanding of how we think about educational technologies, and how they support pedagogy and learning**
- **See many examples of educational technologies, and technology enabled pedagogies to help you understand what's possible**
- **Hopefully, inspire you to explore educational technologies that you might use in your course(s)**
  - Today will not be a hands on workshop, though we may be able to do demos over lunch and at the end of the workshop

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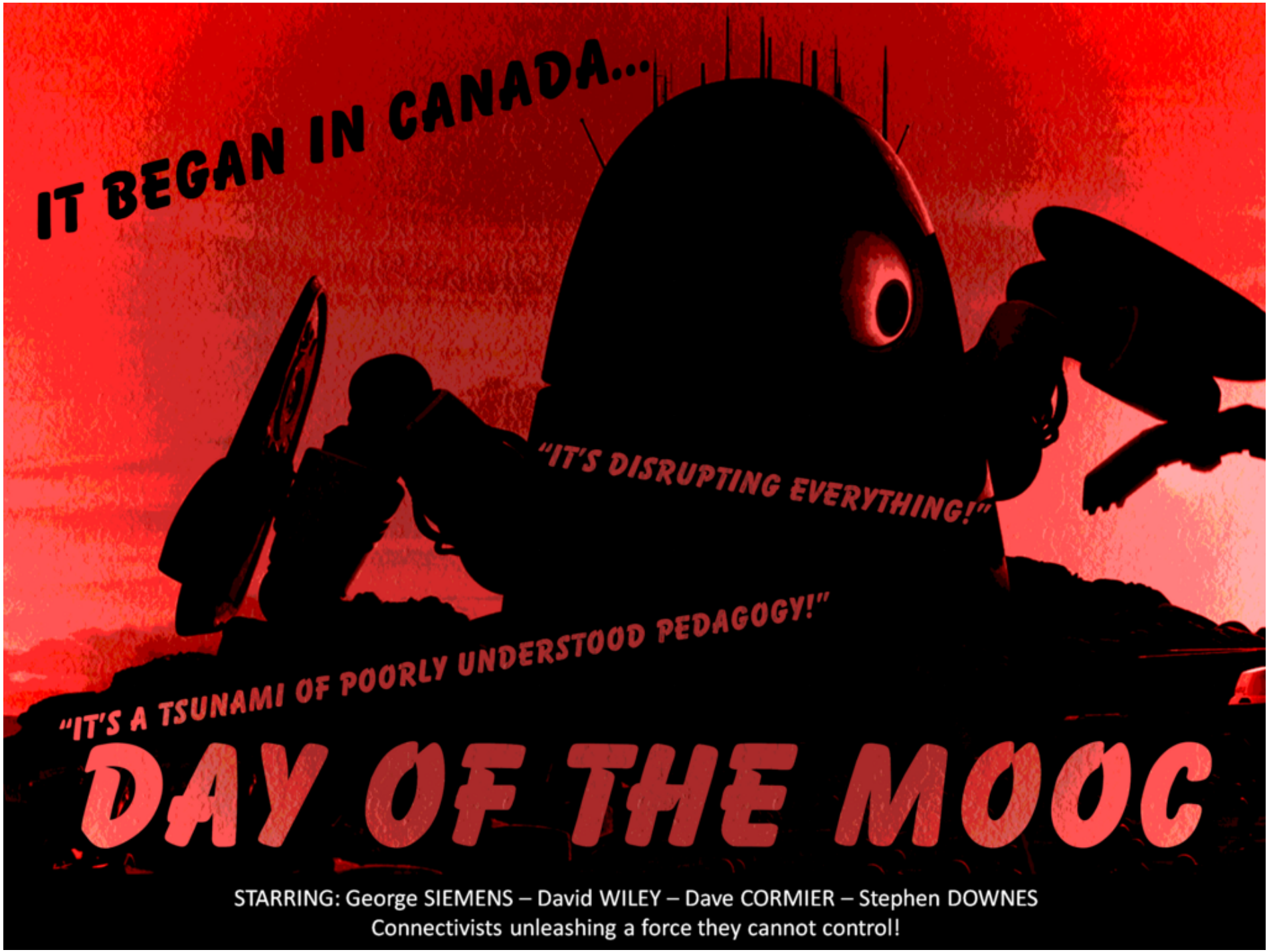
Part 2: Setting the Stage

Global Events Affecting Education…

- **Global financial crisis**
  - Dramatic reduction in education budgets, continuing rise in costs, and rise in student loan debt
- **Changing perceptions of the value of a university degree**
- **Rush for development in many countries**
  - Scale of the numbers of students eligible for education but for whom there is no capacity

A Time of Change…

- **Rise of competency-based education / prior learning assessment**
- **Recognition of the "half-life" of learning in many disciplines**
  - Transition to continual learning in many career paths
- **Rapidly changing learner attributes**
- **Rise of openly accessible learning materials and opportunities, at scale**
  - Wikipedia, Open Educational Resources, OpenCourseWare, Creative Commons licensing
  - Khan Academy, Codecademy


IT BEGAN IN CANADA...
"IT'S DISRUPTING EVERYTHING!"
"IT'S A TSUNAMI OF POORLY UNDERSTOOD PEDAGOGY!"
DAY OF THE MOOC
STARRING: George SIEMENS – David WILEY – Dave CORMIER – Stephen DOWNES
Connectivists unleashing a force they cannot control!

But I am also a big fan of what happens when a teacher and a small group of students get together in a classroom and real personal interaction happens.

So if you are in the higher education business, you had better be getting your hands dirty with this stuff. The only way to really learn something is to do it yourself.

learning

I laid o putting

It's hard to predi and we do know that real in person interactio part the learning equation. But these new tools will bring important changes. So if you are in the higher education business, you had better be getting your hands dirty with this stuff. The only way to really learn something is to do it yourself.

Our Approach

- **Our approach is technology in the service of pedagogy**
- **Educational technology is not new**
  - Digital learning is becoming more dominant
  - Current era is based in research and development going back to the 1960s

Break

Educational Technology Strategy at MIT

EdTech Strategy at MIT

- **Support faculty and students with experimenting and adopting innovative practices in teaching and learning**
  - Innovative approach in delivering GIRs
  - Make powerful tools and experiments accessible to students.
  - Leverage content and resources across courses and programs
  - Facilitate hands-on learning in new ways
  - Develop educationally valuable software tools

EdTech Strategy at MIT

- **Inform development of educational infrastructure and services**
  - Develop platforms (not one-of) that render sustainability.
  - Implement test-beds for promising educational technologies and new services, to advance teaching and learning.
  - Develop plans for the incubation, early implementation, and the transitioning of delivery systems to long-term core service providers

MIT Educational Technology Initiatives

	Educational Value / Opportunity	Potential Value / Impact
TEAL (8.01, 8.02)	Create an active learning environment for large lecture classes	Cost effective TEAL model for other departments, Virtual TEAL
iLab	Expand range of experiments available for students via remote access to labs	Online lab courses, significantly more lab experiences, more sophisticated labs (utilization of high cost/rare equipment)
Mathlets (18.03, 8.07, 16.90)	Interactive applets to promote deeper understanding of mathematical concepts (relevance to systems behavior; transference)	Utilization by other departments, create additional Mathlets, implement concept with other content areas
STAR (7.012, 7.03)	Bring research software into the classroom bridging research and education	STAR resources enriching online courses
HyperStudio (Metamedia, Cultura)	Tools to support language and culture education	Flexible online collaborative environments

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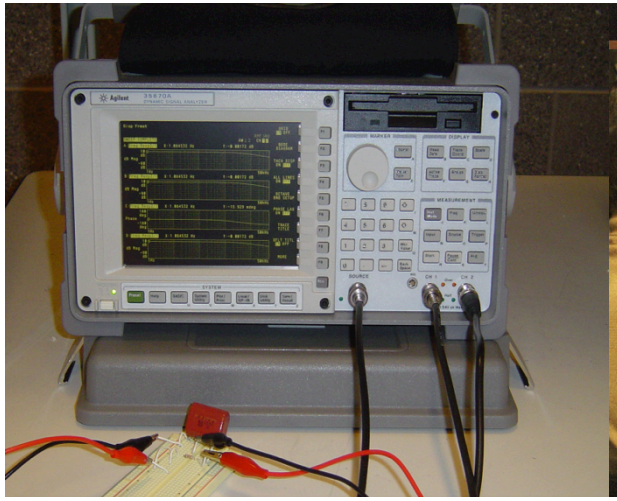
MIT Educational Technology Initiatives

	Educational Value / Opportunity	Potential Value / Impact
NB (2.003, 24.02)	Collaboratively annotate and review documents and problem sets	Online discussion of problem sets, exams, solutions; enable interaction around OCW PDFs
Math CI	Online community where instructors of communication-intensive courses in mathematics can share materials and actively discuss teaching ideas. of communication-intensive courses; Promote pedagogical knowledge sharing;	Being used by the entire Math Department; Possible use at other MIT departments and beyond
OpenCourseWare	Sharing MIT's course materials with the world	Self-learners, faculty can view models of MIT courses
Experimental Learning Environments	Classrooms to support faculty experiments, T/L Innovations, e,g., Project-Based Learning	Continuous curriculum improvement
Athena Clusters	Contemporary learning spaces; student community spaces	Support new collaboration forms

Contemporary Practices: Remote Labs

iLabs:
"If you can't come to the lab… the lab will come to you!"



Order of magnitude more lab experiences
More lab time to users/researchers
More sophisticated labs available
Communities of scholars created around iLabs
Sharing educational & research content

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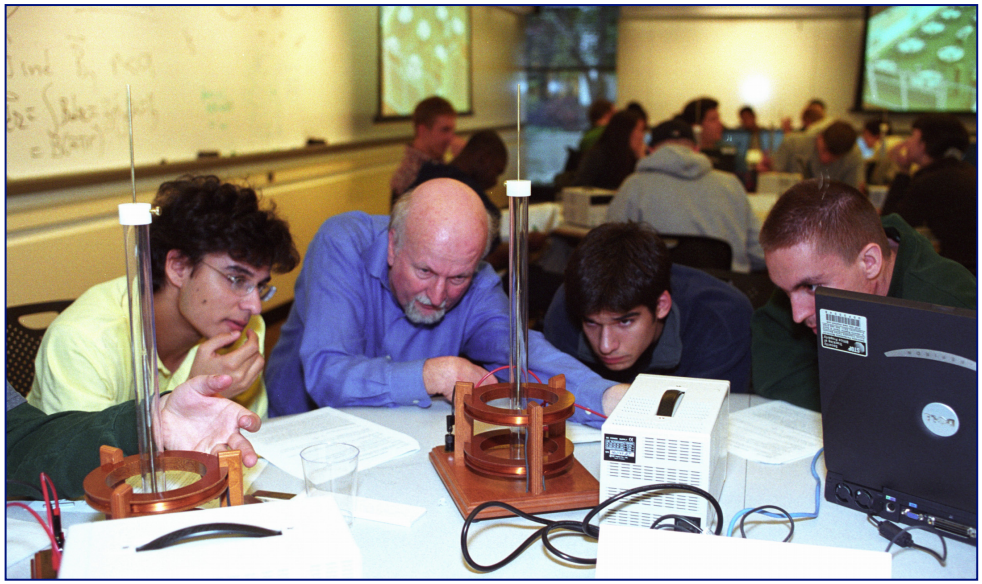
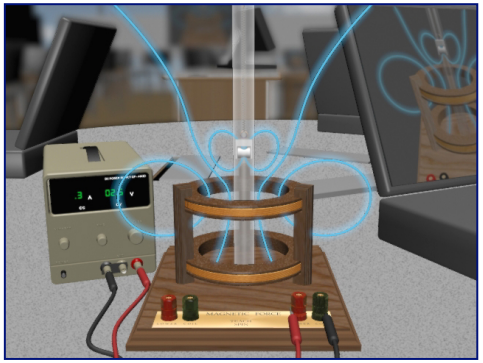
Contemporary Practices:
Active and Blended Learning

Electricity & Magnetism with Studio Physics

- Studio format
- Visualization / simulation
- Desktop lab experiments
- Student teams





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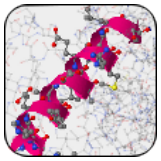
Contemporary Practices: Visualizations and Simulations

STAR: Software Tools for Academics and Researchers

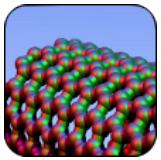
Innovative tools to bring the practice of research to the process of learning

- **StarBiochem**



protein visualization

- **StarMolSim**

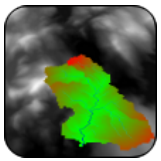


materials modeling

- **StarGenetics**

genetic cross simulator

- **StarHydro**



hydrology visualization

- **StarOrf**

gene finder

- **StarHPC**

parallel programming

http://star.mit.edu

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HTML 5

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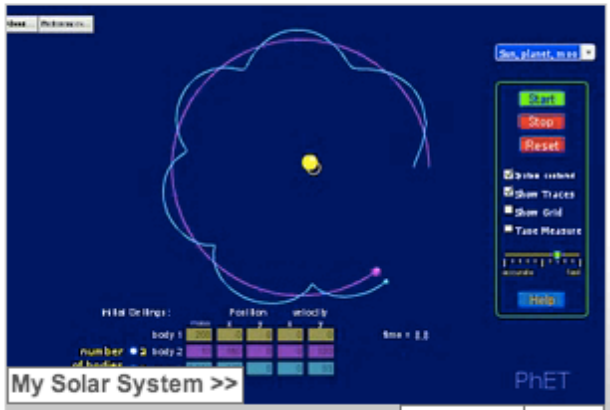

My Solar System >>

< previous | next >

Interactive Science Simulations

Fun, interactive, research-based simulations of physical phenomena from the PhET™ project at the University of Colorado.

Play with sims... >

National Science Foundation

The William and Flora Hewlett Foundation

The O'Donnell Foundation

Recipient of The Tech Award 2011
honoring technology benefitting humanity

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How to Run Simulations	For Teachers	About	PhET is supported by...
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One at a Time	Workshops / Materials	Contact Us	
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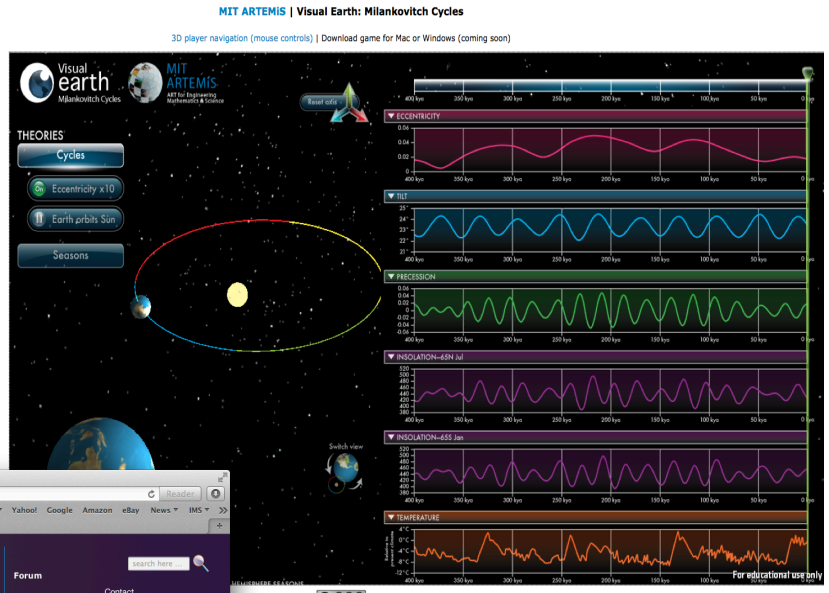
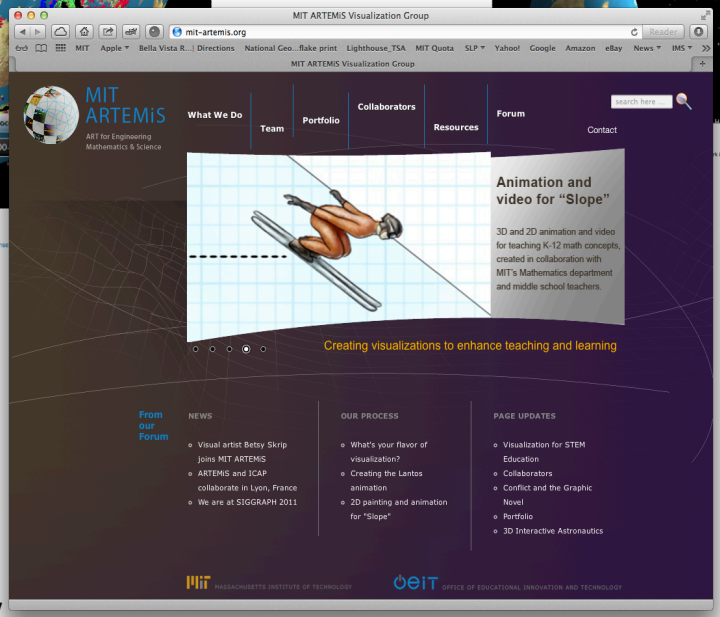
FAQs	Translate the website		

ARTEMiS: Interactive Content and Applications

3D Interactive Tectonics



3D Interactive Earth Cycles



ARTEMiS

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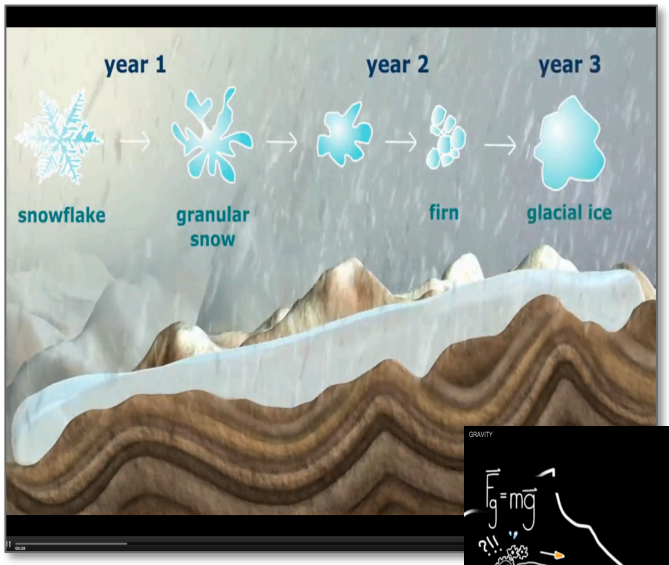
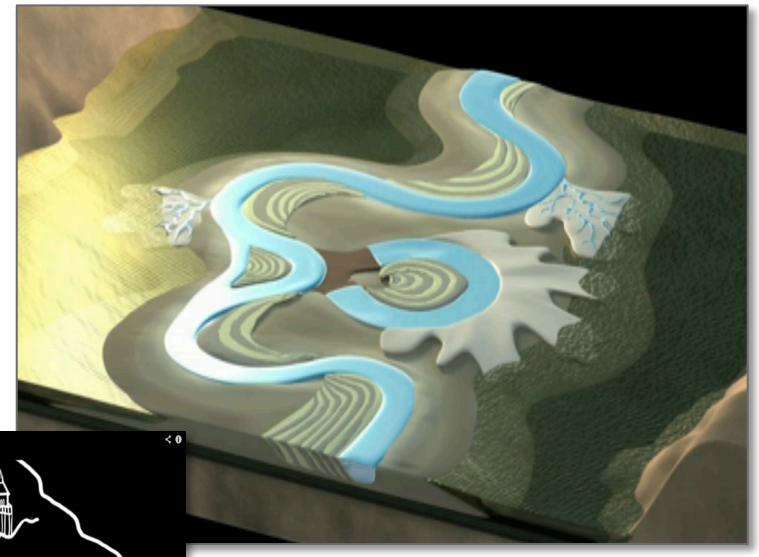
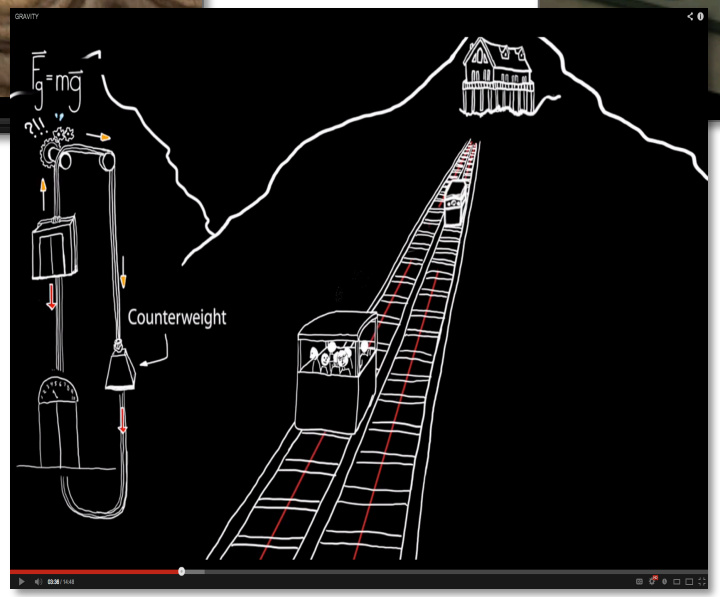
ARTEMiS: Visualization Intensive Learning Experiences



Glacial Structures



Fluvial Environment



Gravity Vignette (SUTD)

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Lunch

What course or topics are you teaching that you believe would be <u>improved</u> with the use of educational technologies?

What can be improved with educational technology?

- Biology Course: Use some of sites (STAR, Curriki) and have students work with them
- TeacherEd Course: Bringing the school classroom into courses thru video of student teachers, building learning
- Many subjects: Improve understanding (videos of English), can make lecture more interesting (use films to teach history; use images of maps on the computer to teach geography)
- Classroom Assessment Course: Online formative assessment/ assignment
- ICT in Education: NGrid, Google Earth and Google Maps
- Collaborative projects between schools
- Collaborate with teachers at other schools
- Collaboratively develop questions
- Use sites to work with individual students
- Videos of different teaching strategies, advantages and disadvantages of prospective students
- Videos to motivate
- Need to pair the use of these technologies with an assessment – *it's just good teaching practice*

What can be improved with educational technology?

- **Examples:**
  - Spreadsheets, PowerPoint, Word
  - Facebook
  - Google documents / drive / forms / hangouts
  - DropBox
  - Skype
- **Video**
  - Watching them
  - Producing them
- **Online Collections**
  - STAR, Curriki, PhET

Contemporary Practices: Digital Humanities

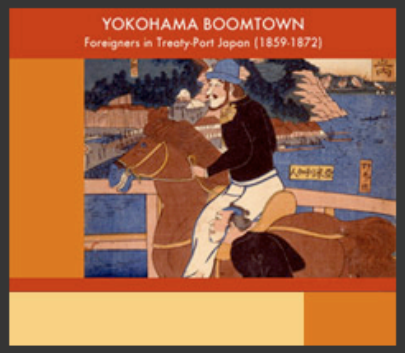
Visualizing Cultures

Visualizing Japan

Black Ships & Samurai
Commodore Perry and the Opening of Japan (1853–1854)

On July 8, 1853, residents of feudal Japan beheld an astonishing sight; foreign warships entering their harbor under a cloud of black smoke. Commodore Matthew Perry had arrived to force the long-secluded country to open its doors. Essay by John W. Dower

[VC|TV] [VC|Curriculum]

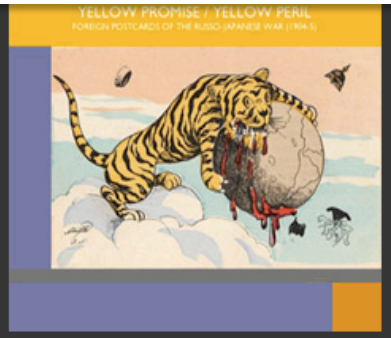


Yokohama Boomtown
Foreigners in Treaty-Port Japan (1859–1872)

This window on the imagined life of foreigners in Japan at the dawn of the modern era is based on the catalogue of the 1990 exhibition at the Arthur M. Sackler Gallery, Smithsonian Institution, *Yokohama: Prints from Nineteenth-Century Japan*, by Ann Yonemura. Essay by John W. Dower.

[VC|TV] [VC|Curriculum]

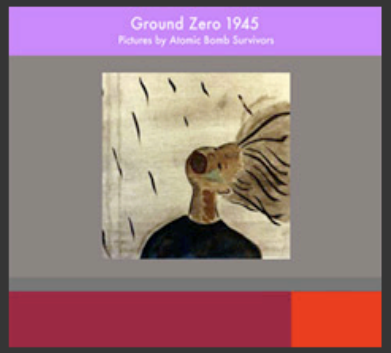
Felice Beato's Japan: Places
An Album by the Pioneer Foreign Photographer in Yokohama



Foreign Postcards of the Russo-Japanese War (1904–05)

The first war to be depicted internationally in postcards is captured here in these dramatic images. Produced in association with the Museum of Fine Arts, Boston. Essay by John W. Dower.

[VC|TV] [VC|Curriculum]



Ground Zero 1945
Pictures by Atomic Bomb Survivors

These drawings and paintings by Japanese survivors of the atomic bomb were created more than a quarter century after the bombs fell on Hiroshima and Nagasaki in August 1945. They are provided by the Hiroshima Peace Memorial Museum. Essay by John W. Dower.

[VC|TV]

Ground Zero 1945
A Schoolboy's Story

This unit presents the illustrated testimony of Akihiro Takahashi, who survived the atomic bombing of Hiroshima on August 6, 1945. Illustrations by Goro

Contemporary Practices: MOOCs

Massively “Open” Online Course

- **“Open” has multiple meanings**
  - In the Open University sense, open enrollment
  - In the licensing sense, Creative Commons licensing
  - In the cost sense, Free or low cost for a certificate
- **Course**
  - There is an instructor or instructional team
  - Often little or no interaction with the instructional team, support provided by peers through discussion forums (in some cases self-forming study groups)
  - Formal “certification” varies

Massively “Open” Online Course (cont.)

- **Participants have multiple reasons for participating**
  - Independent learners
  - Professionals upgrading skills
  - Students with no access to the course or the perceived level of sophistication
  - Students taking a similar course for credit looking for additional practice, learning opportunities
  - And many, many more…
- **Engagement**
  - Varies greatly depending on the reason for participating
  - Registrants -> Completion for Certificate 7-10%

What's unique?

- **Scale**
  - Thousands – Tens of Thousands – Hundreds of Thousands of simultaneous participants
  - Have to mostly get it right the first time, in "regular" classes there's lots of opportunity to redirect and clarify
- **Content (mostly video) and (formative) assessments are tightly coupled**
- **Many innovative activities / assessments**
  - Circuit Simulator, etc.
  - Automatically evaluated

Who has taken, or is taking, a MOOC?

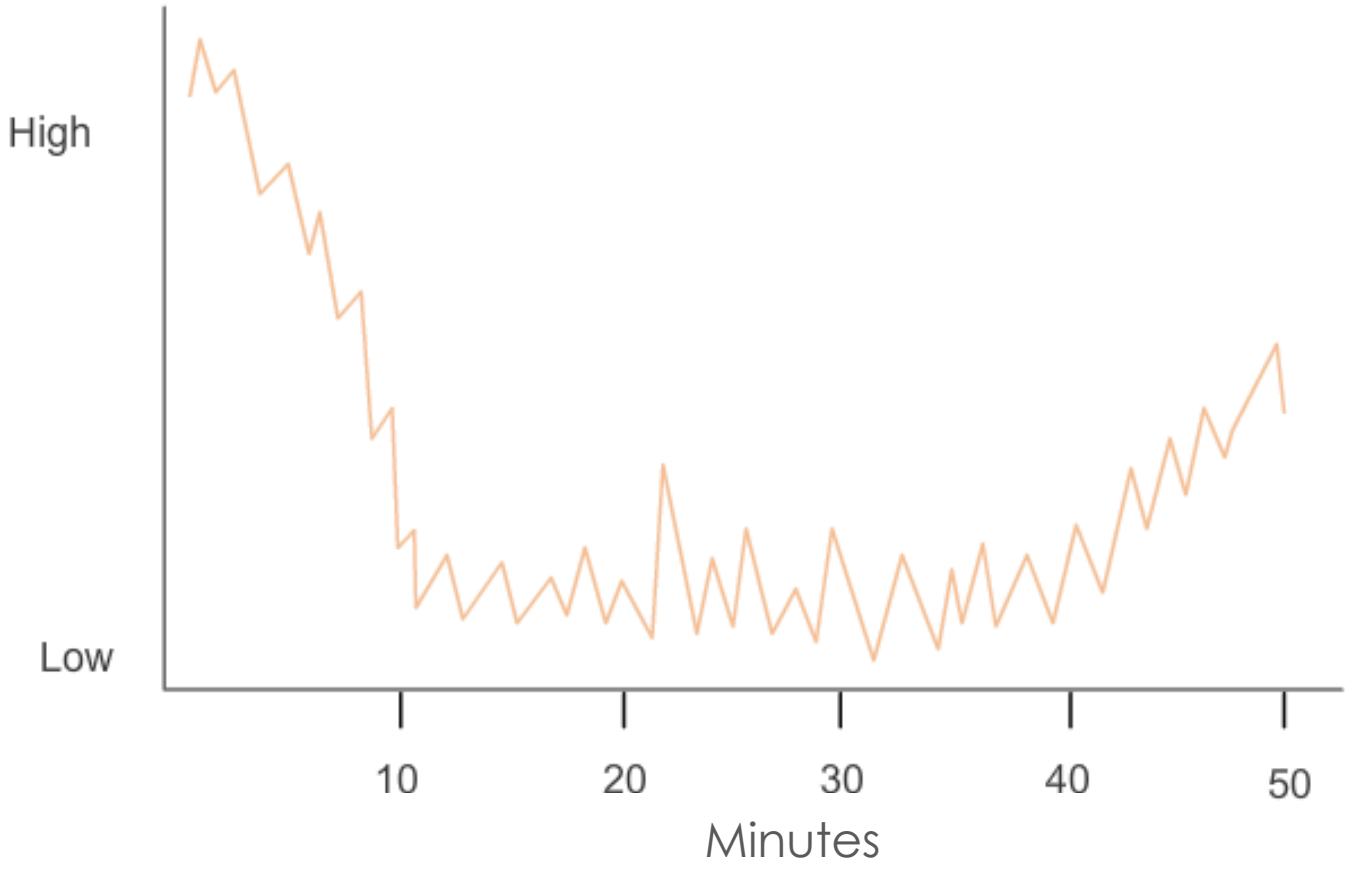
What are your thoughts about the educational technologies being used in the MOOC(s)? How effective are they?

Contemporary Practices: Modularity

Modularity of Content and Activities

- **Pros:**
  - Promotes reusability, and perhaps learner choice
  - Aligns with learning sciences: Many short activities
  - Aligns with competency-based learning: Focus on specific skills
- **Cons:**
  - Modularity for modularity's sake, same problem with learning objects
  - May lead to desire to over-structure courses and activities

Student Attention in 50 Minute Lecture



Hartley, J. & Davies, I. (1978)

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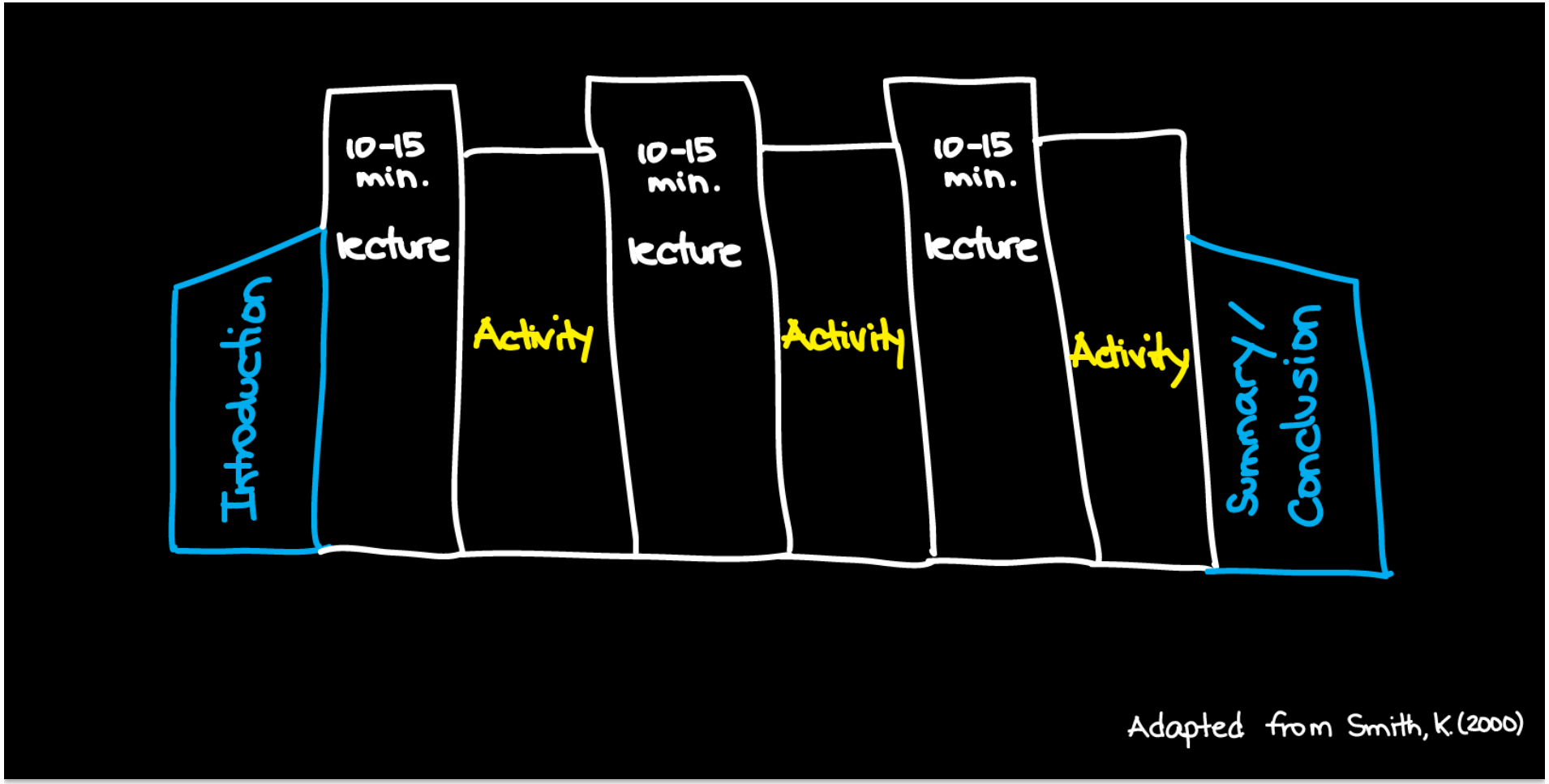
Breaking Up a Class into Blocks of Time



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Modularity through “Concept Based Approaches”

- **Focus on learning outcomes…**
- **…or describing content / activities by concepts or topics**
- **MIT is developing tools and infrastructure**
  - Video Concept Browser (showing today)
  - Concept map authoring, linking concepts and content (not showing today)

Video Recordings of University Lectures

- **Rationale**
  - Resource for students that miss class / want to review
  - Use for distance learning
  - Typically replay the lecture as a whole
- **Pros**
  - “Easy” from an institutional perspective

Video Recordings of University Lectures

- **Cons**
  - Not necessarily interactive, even if the original class was highly interactive
  - Doesn't necessarily support learning
  - Typically lecture as a whole – 1 hour, 1.5 hours long (e.g., OpenCourseWare videos)
- **Can form the basis for MOOCs, or distance learning**
  - "Easy" to do, but is it representing your institution well, or serving student learning well?

MIT's Approach: OEIT Video Concept Browser

- **Record lectures as normal**

"Easy"
- In MIT's case there is we have a professional camera operator using a professional HD camera

- **Tag videos with concepts / topics *during* the lecture**

"Easy"
- Teaching assistant (or top student)
- Concept + time (e.g., Bloom's Taxonomy definition / 11:32 am)
- **No** special tools or technology needed! (Though we're now using some to help.)
- This would be even more effective if the segments were tied to learning otcomes

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OEIT Video Concept Browser

- **Concept-tagged video on web for student viewing**
  - "Bookmarks" to playback video from the concept at the specified time
- **What's needed?**
  - Video tagged by concept and time
  - Video player and hosting that can play video from an arbitrary time
    - YouTube or Amazon S3/Cloudfront with free / low-cost 3rd party player (e.g., JWPlayer, Flowplayer, Sublime player)
  - That's it! (We built a simple web app to make this easier)

Idea from Stanford Learning Lab circa late 1990s

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My Dashboard | My Videos | My Collections | Viewable Collections

MIT TechTV

explore the world of video at MIT

home | browse | collections

search video

upload

i2.002 - 2/13/12 - Lecture 2

Delete video

Playlist Report

Recorded on 2/13/12

Jump to: Introduction: Main goal of 2.002

Jump to: 3D Continuum mechanics

Jump to: Stiffness vs. Strength vs. Toughness

i2.002 Spring 2012

Category: Education | Updated over 1 year ago

Created	February 14, 2012 19:03
Category	Engineering (Change)
Tags	(Add)
License	All Rights Reserved (What is this?) (Change)
Formats	H.264 Video (mp4), mov
Additional Files	(Change)
CC File	(Change)
Thumbnail	(Change)
Viewed	101 times
Privacy	Public (Change)
Sharing Options	Enable ShareThis tools Enable embedding.

Search

Video Concept Browser

mura

MECHANICAL BEHAVIOR OF MATERIALS

- View by Topic
- View by Class
- Recently Viewed

MECHANICS AND MATERIALS

- View by Topic
- View by Class
- Recently Viewed

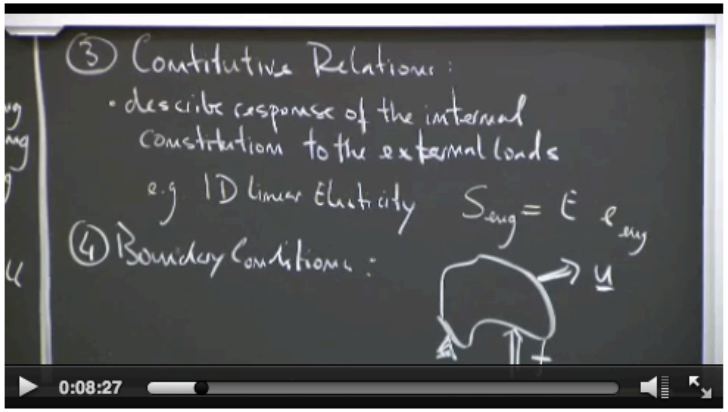
ADMINISTRATIVE

- Create / Modify Classes
- AMPS: Parse XML File
- Download Click Log

- Help
- Logout

Toggle MIT subject number

Video Player

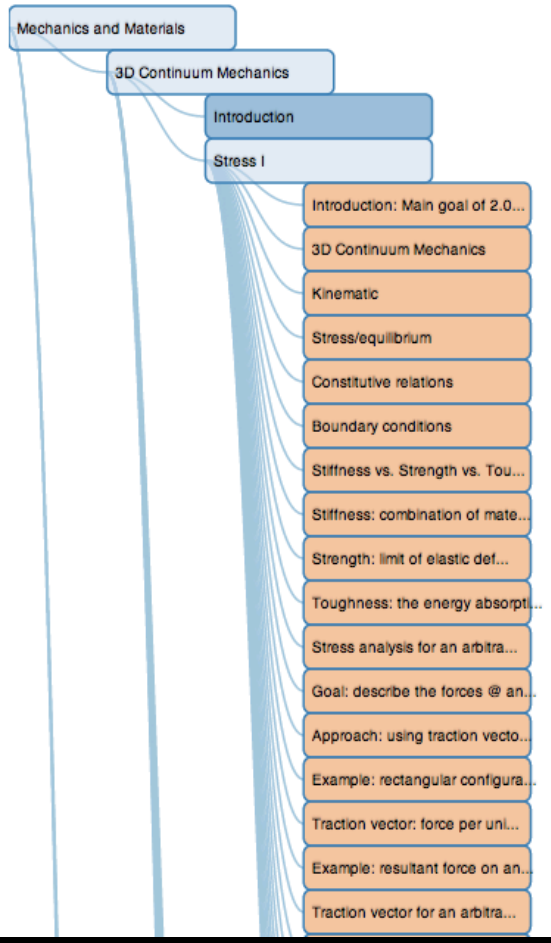


Subject	Stiffness vs. Strength vs. Toughness

More Video Metadata

Class Date	2012-02-13
Class Number	Lecture 2
Branch	Stress I
Sub-Branch	
Speaker	Pedro
Recorded Date	2012-02-13
Views	1

Concept Tree - Mechanics and Materials



Contemporary Practices: Embedded Assessment

Embedded Assessment

- **What is it?**
  - Putting mechanisms for students to check their understanding / mastery of concepts directly in course materials
  - Primarily for formative (self-check, understanding) not summative (exams or formal assignments)
- **Why is it different?**
  - Current tools (Virtual Learning Environments and Learning Management Systems) separate the act of taking a quiz / answering a question from reading or interacting with course content
  - Assessments, anywhere, anytime

OPEN ASSESSMENTS

HOME CONTACT API THE CODE ABOUT SIGN IN SIGN UP

Comparing Fractions

Question 1

1 of 10

$\frac{5}{12}$? $\frac{3}{5}$

- Greater than (>)
- Less than (<)
- Equivalent (=)

Check Answer

stats embed

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Break

Wrap-Up and Discussion

Construct a course/activity/project in collaboration, with a colleague at another university, that uses educational technologies to improve teacher education.

What is the educational problem to address?
How might you address the problem with an educational technology?
What are the obstacles?

Be specific!

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Possible Projects

- **Divide virtual classrooms into smaller groups**
  - Divide into small groups, discussion boards within the forums
- **Online courses**
  - Use webinars to conduct live online sessions, to support all existing content
- **Videos of lectures**
- **Establish iLab for a universities**
  - Seek collaborators to participate, including those that have resources to host labs, etc.
  - Link iLab to link universities together

Possible Projects (cont.)

- **Student understanding in courses—misconception analysis**
  - MUD Card – “What’s the muddiest, unclear, point in a course
  - Could use MOOCs and analytics to get to aggregated misconceptions
- **Content repository**
  - Share videos, lectures by universities
  - Share quality materials
- **Develop a web page for each subject in a program**
  - Content, video, etc.
  - And social community of people interested in the program/topic
  - Subject forum—for teachers and student teachers

Possible Projects (cont.)

- **General Methods of Teaching Course**
  - Students often forget the general methods in subsequent courses
  - Students can upload the best practices in teaching practicum, match these real life experiences with
- **Lack of practical labs**
  - Share videos of examples of student teaching

Participants' Important Take Aways

- Different resource sites (iLabs, PhET, etc.)
- Video lectures and tagging
- MOOCs
- Need to use technology
- Blended learning: and how to bring technology into teaching
- Focus on learning!

Simple, Proven, Compatible & Adaptable

- **Simple**
  - Easy to use, doesn't
- **Proven**
  - Activities, educational technologies need to work for what we want to do
- **Compatible**
  - With the culture of the course
- **Adaptable**
  - Usable in multiple settings, by multiple audiences, shouldn't have to rewrite everything for each possible use

Resources

- ARTEMiS: http://mit-artemis.org/
- CritiqueIt: http://edu.critiqueit.com
- Curriki: http://www.curriki.org/
- NMC Horizon Report: http://www.nmc.org/horizon-project/horizon-reports/horizon-report-higher-ed-edition
- OEIT: http://oeit.mit.edu/
- P2PU: http://p2pu.org
- PhET: http://phet.ucolorado.edu/
- Project Kaleidoscope: http://projectkaleidoscope.org/
- Russian Revolution: http://web.mit.edu/russia1917/
- STAR: http://star.mit.edu/
- Visualizing Cultures: http://visualizingcultures.mit.edu/