Innovative Educational Technology and Educational Infrastructure at MIT

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Outline

• What are your interests?
• About Strategic Education Initiatives
• Options
  – Backstage: Educational Infrastructure
  – MIT’s Approach to Educational Technology
  – Residential Experiments using MITx
• Open Discussion
Strategic Education Initiatives, Office of Digital Learning

- **SEI nurtures and manages education experiments** (projects) driven by MIT’s and ODL’s strategic priorities and mission.
- SEI works with national and international partners to advance the field of digital learning.
  - universities, foundations and trusts, non-governmental organizations and countries

Connecting within ODL and MIT

- SEI partners with MIT faculty, students, staff and alumni.
  - Leverage what’s going on across MIT
- SEI’s work builds upon MIT’s digital learning assets.
  - MITx, MIT OpenCourseWare, MIT pedagogical approaches and other educational tools and services developed by MIT faculty and ODL
Current SEI Projects

Universities

- Leveraging MITx courses at other universities
- Course and curriculum design
- Professional development

Community Colleges

- Curriculum design
- Linking courses / competencies / labor market information (jobs)
- STEM Workforce Development

K-12

- K-12 Videos
- "MIT" STEM learning experiences in Grades 8-12
- Teacher education programs

Next Gen Technology

- "Backstage"
- Learning objectives & concepts
- Assessment authoring and management

BACKSTAGE:
EDUCATIONAL INFRASTRUCTURE
The Problem

• MIT Faculty are **investing heavily in content development** (notes, videos, assessments) for edX and OCW delivery.
• Ideally, MIT should **manage these resources** and make them available as needed to our community for re-use.
• Solution must...
  – Support integration with edX, OCW and others
  – Be adaptable to new technologies and market products

Current Development Workflows
Possible Future

Proposed Solution – Backstage Services

- “Headless” content services with published APIs
  - REST, Python, Java
- Key applications using these services
- Support a developer community
Backstage Core Service Suite

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MIT Educational Content Related Services

- Assessments
- Assets
- Videos
- Learning Objectives • MC3

Applications

- Producer
- VCB
- Assessment Tools
- PRISM
- MIToces

Producer – Asset Management for Reuse

- Motivation
  - Support content reuse in MITx (edX) content workflow
  - Ease content search and integration
  - Explore alternative authoring tools for edX delivery
- Status
  - Proof-of-concept being tested

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Producer and Backstage Services

Assessments

• Motivation
  – Manage, share and author assessment items
  – Track usage and IRT data across assessment offerings
  – Implement APIs for taking as well as managing/sharing

• Status
  – Proof of concept drag-and-drop authoring tool (demo)
  – App to Embed Assessments (QTI assessment items)
  – Physics Question Bank (PQB) under development
Assessment Backstage Services

Video Concept Browser – Browse Video by Concept

• Motivation
  – Enable better use of whole-class lecture video (60-90 minutes) by segmenting by concepts/topics
  – Pre-production for MOOC courses

• Status
  – App to browse lecture videos by concepts (demo)
VCB and Backstage Services

MIT’S APPROACH TO EDUCATIONAL TECHNOLOGY
Our approach is *technology* in the service of *pedagogy*

**EdTech Strategy at MIT**

- Support faculty and students by **experimenting and adopting innovative practices** in teaching and learning
  - Innovative approach in delivering General Ed requirements
  - 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-offs) 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
  – Develop core infrastructure to support teaching and learning
• Support a shift to more blended and online learning

Improve Mastery of Concepts

• Enable students to check their understanding / mastery of concepts directly in course materials
  – Primarily for formative (self-check, understanding) not summative (exams or formal assignments)
  – Strengthened by tie to learning outcomes, content
• “Embedded Assessment”
  – MITx Courses
  – Open Embedded Assessment: Assessments anywhere, anytime
Auto-scored Exercises: Chemistry

H1P2: DECOMPOSITION OF AMMONIUM NITRATE
Solid NH₄NO₃ (ammonium nitrate) decomposes on heating to 400°C, forming N₂O gas and water vapor, H₂O.

(a) Write a balanced chemical equation.

(b) Calculate the number of grams of H₂O that will form on decomposition of 0.10 mole of ammonium nitrate.

Virtual Laboratory: Electric Circuits

CIRCUIT SANDBOX
Here's a sandbox where you can experiment with all the components we've discussed in 6.002a. If you click on 'Save Circuit', your diagram will be saved on the website and you can return at some later time.
RESIDENTIAL EXPERIMENTS USING MITx
3.091: Solid State Chemistry, Fall 2013 & Fall 2014

- MOOC offered Fall 2012, on-campus class revamped in Fall 2013
- MIT students use MITx to do weekly online assessments in proctored classroom and get immediate feedback; students can repeat assessments without penalty for two weeks
- Grades now based largely on online assessments
- Measurable performance improvements over prior terms
- *Experiment: weekly formative online assessments replace traditional exams*

### Wrap-Up – Strategic Education Initiatives

- Technology, in the service of pedagogy
- Innovating, through partnerships
- Build upon core MIT values: Mens et Manus
- Sharing, at MIT and beyond

- Interests: Assessments & Tools, Modularity
MIT Office of Digital Learning
Strategic Education Education Initiatives

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