CREATING, DEPLOYING, AND MAKING SENSE OF AN ONLINE COURSE
CREATION
THE EVOLUTION OF THE COURSE

January Course

Spring Course

LON-CAPA Hwk

LON-CAPA Course

edX Hwk

edX Course

2008,’09

2010,’11

2012

2013

2014?
## COURSE COMPONENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage Revised/Updated</th>
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</thead>
<tbody>
<tr>
<td>400 Text pages (HTML)</td>
<td>80% revised this year.</td>
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<tr>
<td>550 Problems</td>
<td></td>
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<tr>
<td>80 Quiz</td>
<td>40% new this year.</td>
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<tr>
<td>220 Homework</td>
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<tr>
<td>250 Checkpoint</td>
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<tr>
<td>90 Videos</td>
<td>25% new this year.</td>
</tr>
<tr>
<td>30 Surveys</td>
<td>80% new this year.</td>
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(numbers approximate)
FROM EXISTING RESEARCH

- Active students (on-campus)
- Explicit homework levels
- Frequent assessment
- Embedded assessment
- MAPS pedagogy
TYPICAL CLASSROOM
FROM EXISTING RESEARCH

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The Impact of Course Structure on eText Use in Introductory Physics Courses, Seaton, Kortemeyer, Bergner, Chuang, Pritchard (PERC Conference 2013)
Science creates and uses models

Mechanics-specific models →

Analysis of System, Interactions, and Model as a problem-solving tool
DEPLOYMENT
Me

Executive decisions about the course on a daily/weekly basis.

Really a coordinator – the less work I had to do, the better the rest of the course was working.
TEACHING VS COORDINATING

Teaching On-Campus

- Immediate personal communication
- Can change on the fly
- Flexible, limited resources
- High-bandwidth
- See the “Aha!” moment

Running and Online Course

- Communication through text, sometimes video
- Changes take days
- Fixed but extensive resources
- Low-bandwidth
- Hear about it later
The “A” Team:
- Alwina Liu
- Analia Barrantes
- Aaron Brookner

- Write access to the course
- Tackled the majority of bugs, typos, errors, etc.
- Also active in discussion boards
- First test of new problems
- Converting material to edX format
MASTER TEACHERS

- Stroke of genius (Saif Rayyan)
- Recruited from last year’s LON-CAPA course
  - 85%+
  - Mostly volunteer – CEU compensation
- Participation level varied substantially
  - Discussion boards
  - Beta Testing
  - Wiki
- Strongest presence on discussion boards.
COMMUNITY TAS

- Standard part of edX courses
- Recruited from students partway through course
- Recruited for social presence more than subject matter knowledge
TOOLS

- The Issue Tracker
  - Google Document
  - Master Teachers and TAs add, staff removes
- Moderation Tracker
  - For deleted or altered discussion posts
- Staff wiki
- Weekly e-mails from coordinator
ANALYSIS
DATA SOURCES

- **Self-reported**
  - Survey responses

- **Inherent in internet communications**
  - IP information
  - Time data

- **Every single click**
  - Every problem
  - Every text page
  - Every video stop/start/rewind
  - Every discussion post
AGE DISTRIBUTION

Enrolled Student Avg = 28.4
GENDER DISTRIBUTION

Male: 82.6%
Female: 17.4%
EDUCATION LEVEL

Education Level - MITx/8.MReV/2013 Summer

- Doctorate
- Doctorate in another field
- No Ed
- Elementary School
- Associate's Degree
- Other
- Doctorate in science or engineering
- Junior secondary school
- Master's or professional degree
- Bachelor's Degree
- High School

% - Percentage Each Population
SURPRISING DIFFICULTIES

- **Time measurements**
  - What about bathroom breaks?
  - What about leaving the browser window open?
  - What about multiple windows?

- **Location**
  - Routers outside the country
  - IP Spoofing
  - The Great Firewall
RESEARCH GOALS

Measurables:
- Attrition and Activity
- Underlying Skills (as per Item Response Theory and others)

Research-Driven Alterations:
- Target Audience
- Analysis Questions

The Long-Term Goal
RESEARCH GOALS

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ATTRACTION OF TEACHERS

- Direct advertising, teacher communities, e-mail lists, and word of mouth
- Offering CEUs

- Likely to have...
  - Higher academic persistence
  - Greater average physics skill

- One likely cause of higher retention
ENROLLEES IN LON-CAPA COURSE

- PhD (phys): 45% (Spring), 50% (Summer)
- PhD (sci): 10% (Spring), 20% (Summer)
- College Grad: 15% (Spring), 20% (Summer)
- Upperclass: 10% (Spring), 15% (Summer)
- Freshman: 5% (Spring), 5% (Summer)
- Gap Year: 2% (Spring), 3% (Summer)
- HS Senior: 10% (Spring), 15% (Summer)
- HS Underclass: 5% (Spring), 10% (Summer)
- Middle School: 5% (Spring), 5% (Summer)
- K-6 Student: 0% (Spring), 0% (Summer)
How Many Participants Does It Take To Get One Certificate?

- S12 (55 certificates)
- U12 (117 certificates)
- 6.002x (7158 certificates)
- U13 (1030 certificates)
DID WE GET THE TEACHERS?

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% - Percentage Each Population
VENN POPULATIONS

Registrants
~16000

Serious Students
~2500

Advanced Degrees
~1900

Teachers
~700

Pre/Post
327
327 students completed both pre- and post-test. Normalized gain of 0.32, but...
- Only students who stayed in the course
- Not a standard test – pieces from Mechanics Baseline, Mechanics Reasoning Inventory, homework problems.

Average students who completed Mechanics Review were more skilled than average MIT freshmen by 0.6 standard deviations on Item Response Theory.
- Older
- More educated
- Not juggling 3-4 other MIT courses

Comparing Learning in a MOOC vs Blended On-Campus Course, Colvin, Champaign, Liu, Chen, Fredericks, and Pritchard (LAK conference 2014)
LEARNING GAINS

![Graph showing learning gains across different pretest scores and background categories](image)
**RESEARCH GOALS**

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- **Research-Driven Alterations:**
  - Target Audience
  - Analysis Questions

- *The Long-Term Goal*
ACKNOWLEDGEMENTS

GROUP MEMBERS
DAVID PRITCHARD
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ZHONGZHOU CHEN
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TEODORESCU AND BALINT (GWU)
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MITX AND EDX STAFF
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WHAT’S UP NEXT?

- **Life as a Planetary Phenomenon**
  - The origin and evolution of planets
  - The origin and evolution of life
  - Exploring the solar system for life
  - Searching for life beyond the solar system
  - Extraterrestrial intelligence

- HarvardX, Prof. Dimitar Sasselov

- Six-to-nine month post

- Probably spring, might be delayed until summer.