Access and Excellence: MOOCs & Online Education at UC Berkeley

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Goals and Anti-Goals

<table>
<thead>
<tr>
<th>Academic model</th>
<th>Extend &amp; improve existing academic models</th>
<th>Radically new model or “redefinition” of higher ed or UCB identity</th>
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<tbody>
<tr>
<td>Technology</td>
<td>Enhance on-campus instruction</td>
<td>Constrain instruction to match technology</td>
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<td>Enable new education research</td>
<td>Lower costs</td>
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<td>Access &amp; Excellence</td>
<td>Sustain mission of <em>access &amp; excellence</em></td>
<td>Opportunity at expense of quality or reputation</td>
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<td>Preserve high standards &amp; proven governance structures</td>
<td>Lower standards for students or instructors</td>
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<td>Innovation</td>
<td>Encourage experimentation</td>
<td>Impose early standards or make long-term big bets</td>
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Online education is *permanent & strategic*: how to help *access & excellence* mission?
BerkeleyX

- edX.org, a not-for-profit 501(c)(3)
  - UCB leads X Universities consortium, sits on edX Board, contributes platform technology

- Free, noncredit, open materials & platform

- Focused on high quality
  - Intellectual rigor comparable to campus course
  - Recognized great teachers who are also thought leaders in their fields

- Research to enhance campus experience

- Participation is 100% voluntary
Autograding: Automated Non-Trivial Assessment

- Automated: machine grading (vs. human)
- Nontrivial: deeper feedback (vs. just Yes/No)
- Short answer (multiple choice, numerical, fill in blank)
- Long answer: highly assessment-specific
  - Programming assignments
  - Circuit simulation/Physical simulation
  - Statistics visualizations
  - etc.
Scale

- 7k-10k students/year (vs. 250-500)
- Multiple opportunities to
  - “I want to help with future offerings”
  - “Better than any course available at my university”

1500-3500 students per cohort

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<td>CS 169.1</td>
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<td>CS 169 F'12</td>
<td>180</td>
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on Coursera

on EdX

100% (50K, 30K, 20K, 30K) “enrolled”

~50% watch ≥1 lecture

~20% submit ≥1 HW

~7-10% “pass”
Myth:
Since we are already capturing video lectures, we've done most of the work to create a MOOC.

Reality: Even an adequate MOOC involves much more work than just recording the lectures.
Want to do MOOC yourself?

• Having a Rerun Plan is Better than Being Perfect
  – Needed feedback from MOOC students before we could improve it ourselves

• Consider Delegating
  – MOOC alumni volunteer as “World TAs”

• Dry Run the Technology
  – With 1000s of students, must be perfect

• Divide to Conquer
  – 12 weeks lecture => two 6-week MOOCs
Myth: Universities will use MOOCs to save money by firing faculty & TAs, sacrificing education quality.

Reality: MOOCs can instead save money by improving throughput and increasing education quality.
Universities will save $ by firing faculty?

- Reality: Save $ by increasing **throughput**
- Berkeley: 4X students in SWE course
- SJSU tried EE MOOC from MIT
  - MOOC homeworks, lectures
  - Same exams as prior SJSU course
  - 5% higher 1st exam, 10% higher 2nd
  - 91% got C or better (59% before)
- Surprise: improve quality **and** throughput
Myth: MOOCs are not useful because they cannot replicate all aspects of traditional instruction.

Reality: MOOC *complements* traditional instruction
Pitfall: assuming 1-for-1 substitution (vs. “enhance, not replace”)

• “Autograding cannot replace instructor help”
  – Can it level-up student confidence & raise productivity of instructor interactions?
  – Can it improve level of polish of assignments?
• “Online delivery of course X can’t replace classroom discussion”
  – What foundational skills can online strengthen?
• “Online interaction can’t replace face to face”
  – How & why does perceived community in online courses improve student engagement & retention?

* J.C. Richardson & K. Swan, Examining Social Presence in Online Courses in Relation to Students’ Perceived Learning and Satisfaction, J. Async. Learning Networks 7, 2003
Myth: MOOCs distract faculty from focusing on improving their on-campus teaching.

Reality: MOOCs can help to improve on-campus courses.
Distraction from on-campus course?

- Reality: help **improve** on-campus courses
- Berkeley: MOOC improved evaluations (& size)
- Enough students to use inferential statistics
  - *Exploratory factor analysis*: test comparable concepts, vary exams
  - *Item response theory*: which questions more difficult for good students
  - *A/B testing*: which approaches lead to better learning outcomes
Classroom + MOOC = SPOC
(Small Private Online Course)

- Accommodate increased demand in impacted SW Engineering course (by 4x!)
- Autograders improve TA leverage, fulfill student request for more practice → stronger design projects
- Course ratings up despite larger size
- ~800 instructors passed MOOC; 8 now using SPOC & book
The MOOCLab

- Support MOOC projects that enable new research in online education
- Reduce research results to practice in tools & training offered to instructors

1. **Research**
2. **Gather & analyze large data set**
3. **Deploy to Berkeley students, refine**
4. **Deploy to MOOC students**
Summary

• MOOCs can improve access and save money, just not necessarily in the way they are described in the press
  – Synergy between SPOCs and MOOCs
  – Opportunity & obligation to do the research on what works and doesn’t in MOOCs

• Maintain Berkeley's excellence in research & teaching
  – Better experience for students
  – More effective tools for instructors
  – Benefit for 100,000s of non-Berkeley learners