Bigger is Better? Using MOOC Technology in a Software Engineering Course

Armando Fox
fox@cs.berkeley.edu
Background: Software Engineering (CS 169)

- Focus: modern software engineering practices for Software as a Service
- “Impacted” at upper division
  - Restricted elective with design component
- Already thinking about autograding, inspired by CS 188 Artificial Intelligence
Adapting for a MOOC

• Nontrivial autograders for programming assignments (open source)
• Adapting lectures to 7-10 min segment + peer learning/self assessment question
  – 7-10 min segment + peer learning question
  – 8-10 hrs/week ugrad to convert & format videos
• No design project in MOOC!
• Same HWs, quizzes, deadlines
• Offered 3 times on Coursera, 3 times on EdX, plus new “part II” now on EdX
# Autograding Strategies

<table>
<thead>
<tr>
<th>Submission</th>
<th>Grading strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upload code file(s)</td>
<td>• RSpec (correctness)</td>
</tr>
<tr>
<td></td>
<td>• [soon] reek/flay (code style)</td>
</tr>
<tr>
<td>Upload test case files</td>
<td>• Mutation testing (Amman &amp; Offutt): app with inserted bugs should fail tests</td>
</tr>
<tr>
<td>Submit URI of cloud-deployed app (Heroku)</td>
<td>• Remote (cloud-based) integration test using Mechanize</td>
</tr>
<tr>
<td>Interactive short-answer/multiple-choice</td>
<td>• Our tools emit both printed &amp; online-format quizzes</td>
</tr>
</tbody>
</table>

[Diagram: Submission, Grading strategy, Rubric, Feed-back]
Classroom + MOOC = SPOC
(Small Private Online Course)

• Accommodate increased demand (now admit juniors, vs. turning away graduating seniors)
• 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 our SPOC & book
[I’m going to wing this.]
Takeaway: Extend, Not Replace

• SPOC improved on-campus instruction
  – Instructor leverage, great analytics, students get quick feedback leading to mastery, ...

• Autograders hard to get right, immense amount of work, but amortizable
  – And students react very well to the extra feedback

• We will continue to use this approach even if don’t care about MOOC

• Similar story: CS 188 (Artificial Intelligence), Stat 2 (Intro. Descriptive Statistics)