From the Virtual Trenches

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Technology, by and large

Cell phones

The miracle of cell phones is that, from almost anywhere in the world, they enable you to be frustrated.

Online education

The miracle of online instruction is that, from almost anywhere in the world, it enables you to work harder for comparable learning outcomes.

What makes online instruction special?

- ~~videotaped lectures~~
- ~~remote delivery of documents~~
- ~~audio/video conferencing~~
- dynamic, interactive content
- customization/personalization
- analytics
- up-to-date content: can add/edit material and fix errors instantly
- automation of drudgework

Distance learning isn't new.

But the Internet makes some interesting new things possible—at a cost.

Statistics W21

- first online course approved by COCI taught at Berkeley
- intended Business & Economics majors, mostly
- enrollment 200–425, many timezones, including Asia
- hybrid 1997–2006; online 2007–present
- mastery-based: $\leq$ 5 submissions, $\geq$ 80% or no credit
- in-person final ($\approx$50 students take proctored off-campus)
- typically 7 GSIs holding $\approx$140 office hours per week
- “learning preparedness assessment” by phone

Milestones

- text online in 1997, including applets for key concepts, glossary
- online, machine-graded assignments from 1998
- dynamic examples, exercises, individual homework from 2000
- continually add topics, edit, and re-factor to improve UX
- “functional grading” from 2003
- online office hours with whiteboard, etc., from 2007
- online recorded lectures from 2009
- analytics and deep video anchors from 2011

SticiGui interactive “text”

- 222 XHTML files, ≈140,000 lines
- 63 Java classes, ≈15,000 lines
- 28 JavaScript libraries, ≈16,000 lines
- 4 CSS files, ≈2,000 lines
- 37 data files, ≈11,000 records

Approaching 8000 hours of work.

Onsophic

- platform to discover course materials, assemble and deliver courses, collect analytic data
- built on Sakai (as is bSpace)
- customization for W21: SMS for office hours, heat map granularity, etc.

Analytics in W21

- viewing sections of SticiGui, lectures, podcasts
- viewport events
- following links
- viewing footnotes
- attempting practice problems
- submitting homework

Simple to plumb because of SticiGui architecture: added about 50 lines of JavaScript

Generated about 1.4 million analytic records in summer 2011

Questions analytic data can answer

- Do students who do more self-test exercises do better than those who do fewer?
- Do students who spend the majority of their time watching online lectures do better than those who spend the majority of their time with the text?
- What student actions/behaviors predict mastery?
- Do interventions to promote such behavior increase mastery?

Example: time versus assessment score, Spearman test

- Histograms, data taxonomy: $p \approx 0.8$
- Combinatorics: $p \approx 0.03$

What's online best for?

- present material in many "modes" to suit different learning styles
- unlimited practice (requires unlimited programming)
- mastery-based grading
- simulations and "discovery experiments"
- geographic flexibility
- analytics
- experimentation/intervention

What's online worst for?

- human connection, empathy, warmth, civility
- low "bandwidth": harder to help students interactively
- faculty time:
  - authoring effective, reliable content
  - maintenance
  - being virtually "present" to most students (10h/day?)
- ensuring accessibility: screen readers, etc.
- friction from tech issues:
  - ensuring students have the right tech
  - diagnosing students' failure to follow instructions
  - browser/OS upgrades during the term?
- how paternalistic or "Big Brother" do we want to be?
- university reward structure does not encourage experimentation
- teaching evaluations

Keep in mind

- big difference between class of 30 and class of 425
  - difference is even bigger online
- not suitable for all subjects
- can't just flip a switch to move a course online, or quality will suffer
- have to tailor pedagogy and content to the medium
- Internet facilitates bad behavior, rudeness, cheating, etc.
- dedicated faculty involvement crucial
  - need to know possibilities and limitations of the technology
  - hard to offload programming related to pedagogy
- need more office hours online than face to face
- iterative improvement
- continual maintenance

Unintended consequences

- now speak Python, Perl, Java, JavaScript, XHTML, CSS, . . .
- know when every browser or operating system has an update—things break
- my teaching evaluations have suffered, partly through low response rate