Using MOOCs to enhance on-campus education
Experience, lessons, and research opportunities

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Nashville, TN

Presentation to
No way back? Exploring the impact, data and potential of MOOCs

Sponsored by
Association for Learning Technology
Wednesday, November 6, 2013

Also: ITHAKA S+R Sustainable Scholarship Symposium (http://vimeo.com/53361649) (10/16/12)
COURSERA Webinar (http://www.youtube.com/watch?v=v4MKx-SEKr4) (1/17/13)
ABET 2013 *Panel titled The Future is Now* (4/12/13)
AAUP 2013 Panel on *Open Access Textbooks and MOOCs (6/21/*13)
COURSERA in TN (http://news.vanderbilt.edu/2013/06/coursera-videos/) (6/24/13)
SEC Deans Meeting (8/1/13), Medical Grand Rounds (9/10/13), VUIT All Hands Meeting (10/2/13)
Andrew W. Mellon Foundation (10/28/13), Association of Research Libraries Leaders Fellowship Institute (11/12/13)
PI Forum on Virtual Environments and Game-Based Learning in the Classroom (11/18/13)

Transforming American Education

Learning

Powered by Technology

National Education Technology Plan 2010
Executive Summary

U.S. Department of Education
Office of Educational Technology

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Learning: Engage and Empower

Infrastructure: Access and Enable

Teaching: Prepare and Connect

Assessment: Measure What Matters

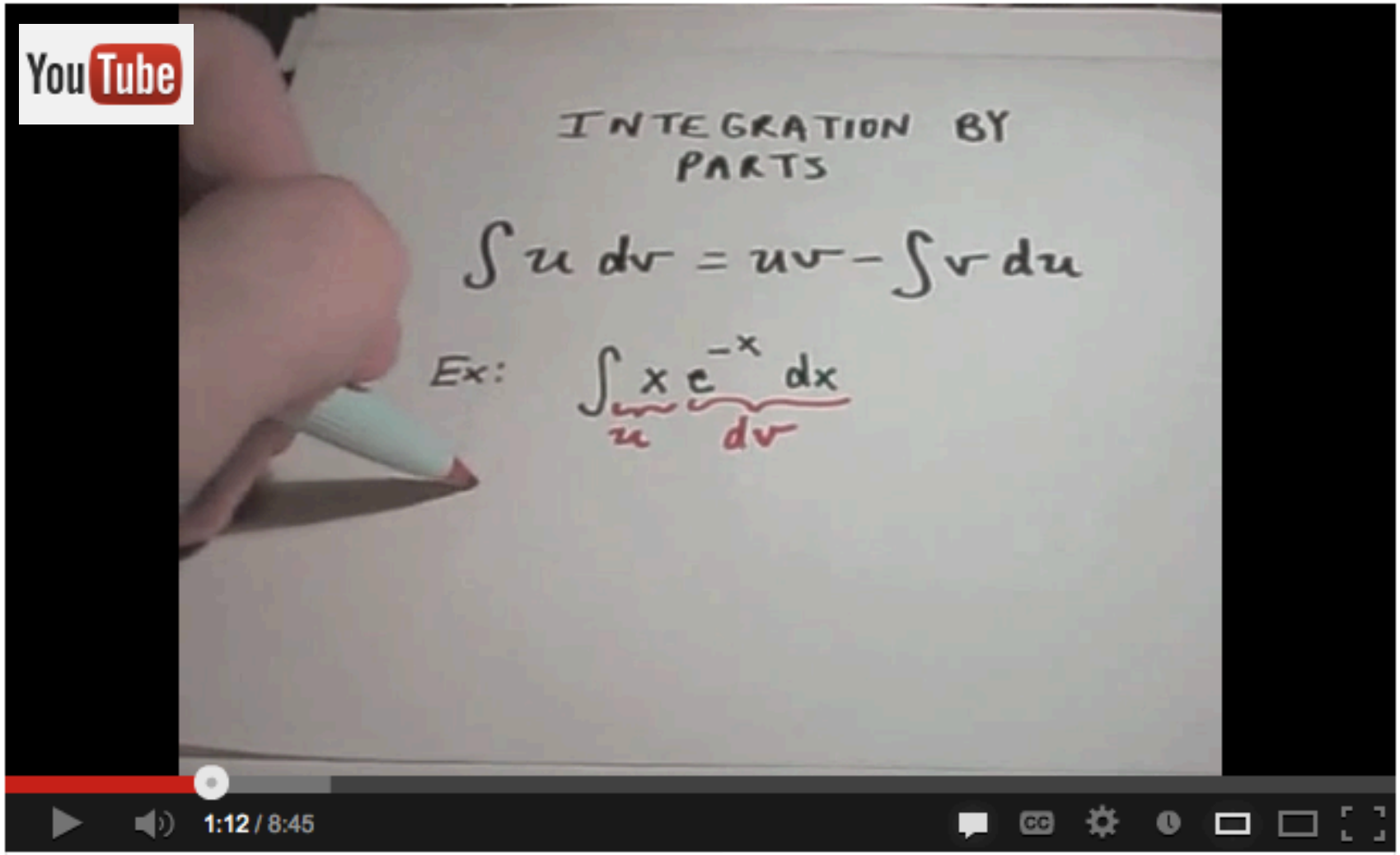
Productivity: Redesign and Transform

A Grand Challenge: Personalized Education

Learning: Engage and Empower

"The model of learning described in this plan calls for engaging and empowering learning experiences for all learners. The model asks that *we focus what and how we teach to match what people need to know, how they learn, where and when they will learn, and who needs to learn.* It brings state-of-the art technology into learning to enable, motivate, and inspire all students, regardless of background, languages, or disabilities, to achieve. It leverages the power of technology to provide personalized learning and to enable continuous and lifelong learning."

National Education Technology Plan 2010, Executive Summary
U.S. Department of Education, Office of Educational Technology, p. 10



Integration by Parts

Uploaded on Apr 4, 2008

Derive the IBP's formula https://www.youtube.com/watch?v=q_BP4...

patrickJMT · 1,586 videos

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595,929

2,391 61

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Vanderbilt Fall 2011

http://www.cccblog.org/2011/11/22/more-stanford-cs-entrepreneurship-courses-go-online/

The Computing Community Consortium Blog

A Service for the Computing Research Community

Home | About the CCC | About this blog

More Stanford CS, Entrepreneurship Courses Go Online

November 22nd, 2011 by Erwin Gianchandani

Post a comment »

This fall, Stanford launched a highly-publicized experiment in online learning, offering three of its most popular introductory computer science classes — Machine Learning, Introduction to Databases, and Introduction to Artificial Intelligence — through the Web for free. The classes, taught by Stanford faculty, are being held online in conjunction with the regular on-campus courses. And by all accounts, they've been a huge hit: over 130,000 people signed up for the AI class, and while the numbers have dropped off considerably now that school is actually in session, some 35,000 students turned in the first three weeks of homework assignments (in addition to the 175 Stanford students taking the class on campus).

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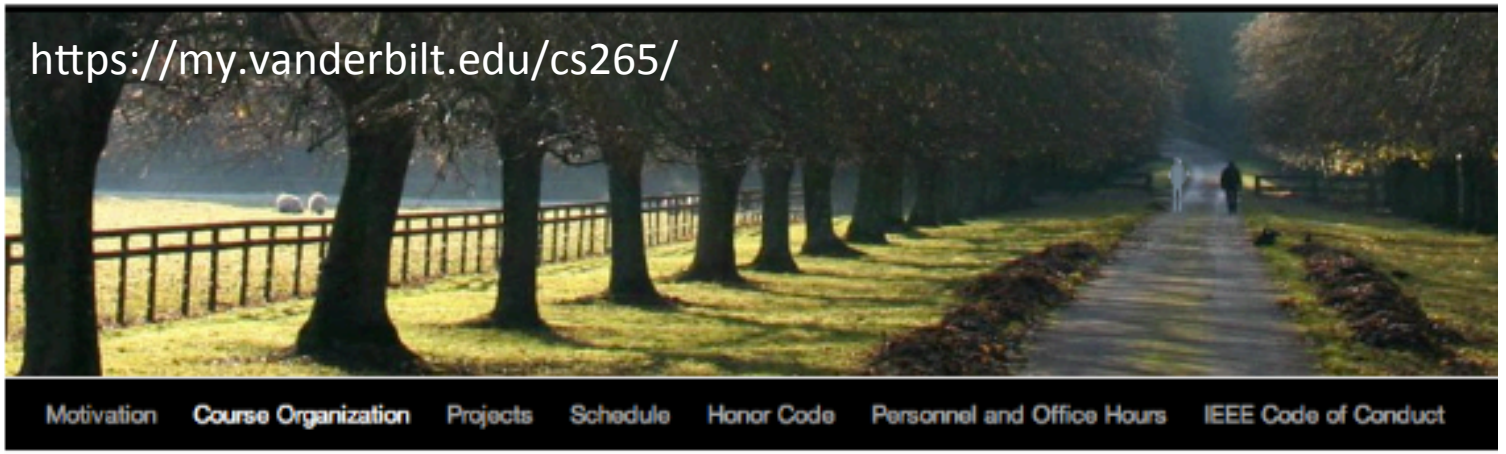
Introduction to Database Management Systems

An example in Database class



WEEK 2

Flipping the class: "Passive" info reception out of class; active learning in class

To Do (additionally) before Jan 14/15 Quiz: read (a) Sections 2.3 and 2.4, from textbook; **watch** videos at https://class.coursera.org/db/lecture/index "Querying relational databases" (6 min), and "Relational Algebra" (18 min + 20 min)

Video lectures from a Stanford MOOC

QUIZ 1 (Jan 14/15): Quiz 1 (You have 15 min from time of download to complete this quiz

PLENARY Class meeting (Jan 15): Discussion on Introduction, Relational Model from readings and video to date; watch http://www.youtube.com/watch?v=jbkSRLYSojo and answer post (to Oak Discussions) the questions given here Hans Rosling Database Exercises (week of Jan 13); illustrate study group dynamics; announce project teams and meeting times

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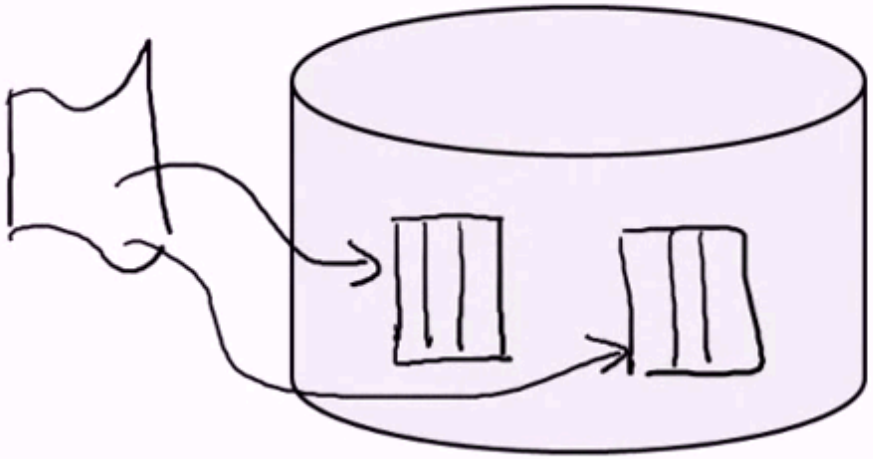
Steps in creating and using a (relational) database

1. Design schema; create using DDL
2. "Bulk load" initial data



https://class.coursera.org/db/lecture/3

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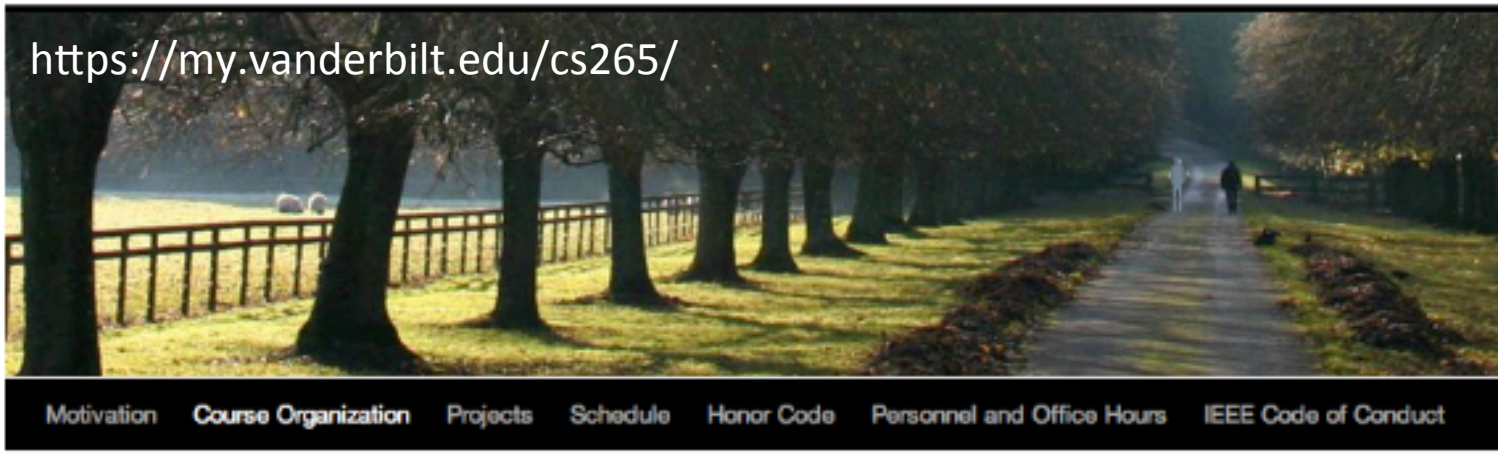
Example in-class session

Introduction to Database Management Systems



In Class Exercises

In Database class, 'flipping' enabled small-group problem solving and/or treatment of larger scale database designs that illustrated the concepts.

1. Watch the Hans Rosling video on visualizing data at http://www.youtube.com/watch?v=jbkSRLYSojo (a 4 minute video)

2. Dr. Rosling concludes that the analysis involved plotting "120,000 numbers." Explain where the 120,000 count came from.

3. List the attributes that you believe must be stored in a database that supports this analysis (and perhaps similar analyses)

4. Give candidate (tentative) relational schema (at least two) for a database that would support this and similar analyses

5. Give three queries in relational algebra over the schema that you give in part 4, which you think would be useful for the video's analysis or a similar analysis

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Hans Rosling's 200 Countries, 200 Years, 4 Minutes - The Joy of St...

BBC · 13,926 videos

Subscribe 1,410,914

5,936,288

22,021 224

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Brief history with (other professors') MOOCs

Since Spring 2012: Have used online lectures by others for

- **Database** (Spring 2012, Spring 2013)
- **Machine Learning** (Spring 2012, Fall 2012)
- **Artificial Intelligence** (Fall 2012)

Summary of all use

With following instructor and course ratings on 5 point scale ; 3 is "average"

- **Database (S13) Instructor Average: 4.41 (0.69) Course Average: 4.24 (0.72)**
  Database (S12) Instructor Average: 4.27 (0.74) Course Average: 3.63 (0.64)
  pre-MOOC use: 4.00 (0.95) from Spring 2011 3.41 (1.11)
- **Machine Learning (F12) Instructor Average: 4.16 (0.68) Course Average: 4.16 (0.68)**
  Machine Learning (S12) Instructor Average: 4.33 (0.66) Course Average: 4.22 (0.41)
  pre-MOOC use: 3.83 (0.89) from Spring 2006 3.66 (1.11)
- **AI (F12) Instructor Average: 4.25 (0.66) Course Average: 4.00 (0.70)**
  pre-MOOC use: 4.25 (1.03) from Fall 2011 4.05 (0.72)

Summary Observation: Instructor rating and course rating *means went up* or held steady; *standard deviations went down;* but *beware confounds!*

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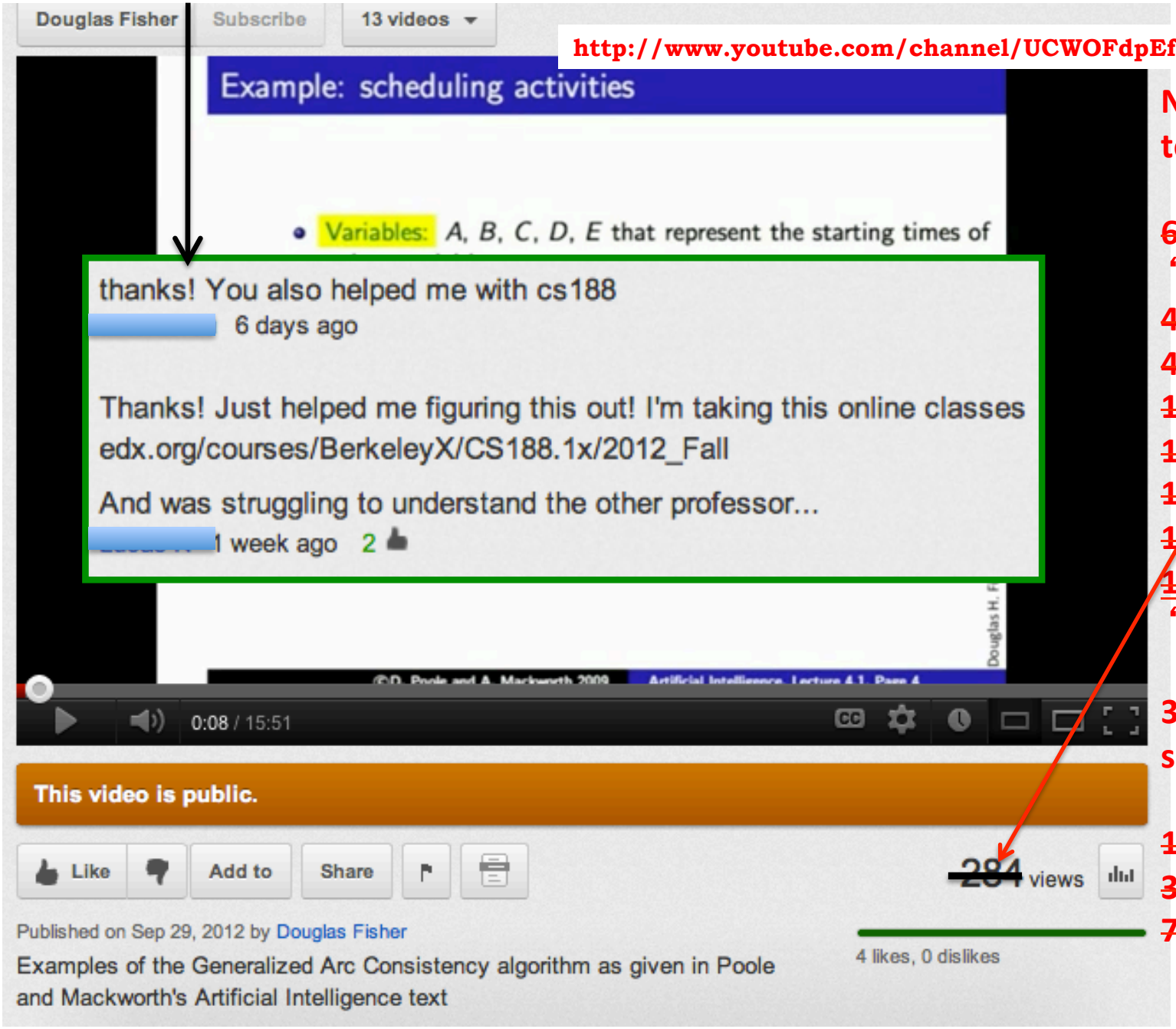
Video call out(s) from an AI MOOC in Fall 2012 of MY video



Number of Views, top-8 videos

~~6,353~~ **biggest 'hit'**
~~4,657~~
~~4,533~~
~~1,662~~
~~1,557~~
~~1,471~~
~~1,071~~
~~1,007~~ **my first 'hit'**

37,262 views total since Fall 2012

~~119~~ **thumbs up,**
~~3~~ **thumbs down;**
~~73~~ **subscribers**

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Why this pattern? (hypothesis – because of MOOCs)

Performance

VIEWS
37,262 ▲

ESTIMATED MINUTES WATCHED
96,077

SUBSCRIBERS
121

Engagement

LIKES
155

DISLIKES
5

COMMENTS
42 ▲

SHARES
5 ▲

FAVORITES ADDED
25 ▲

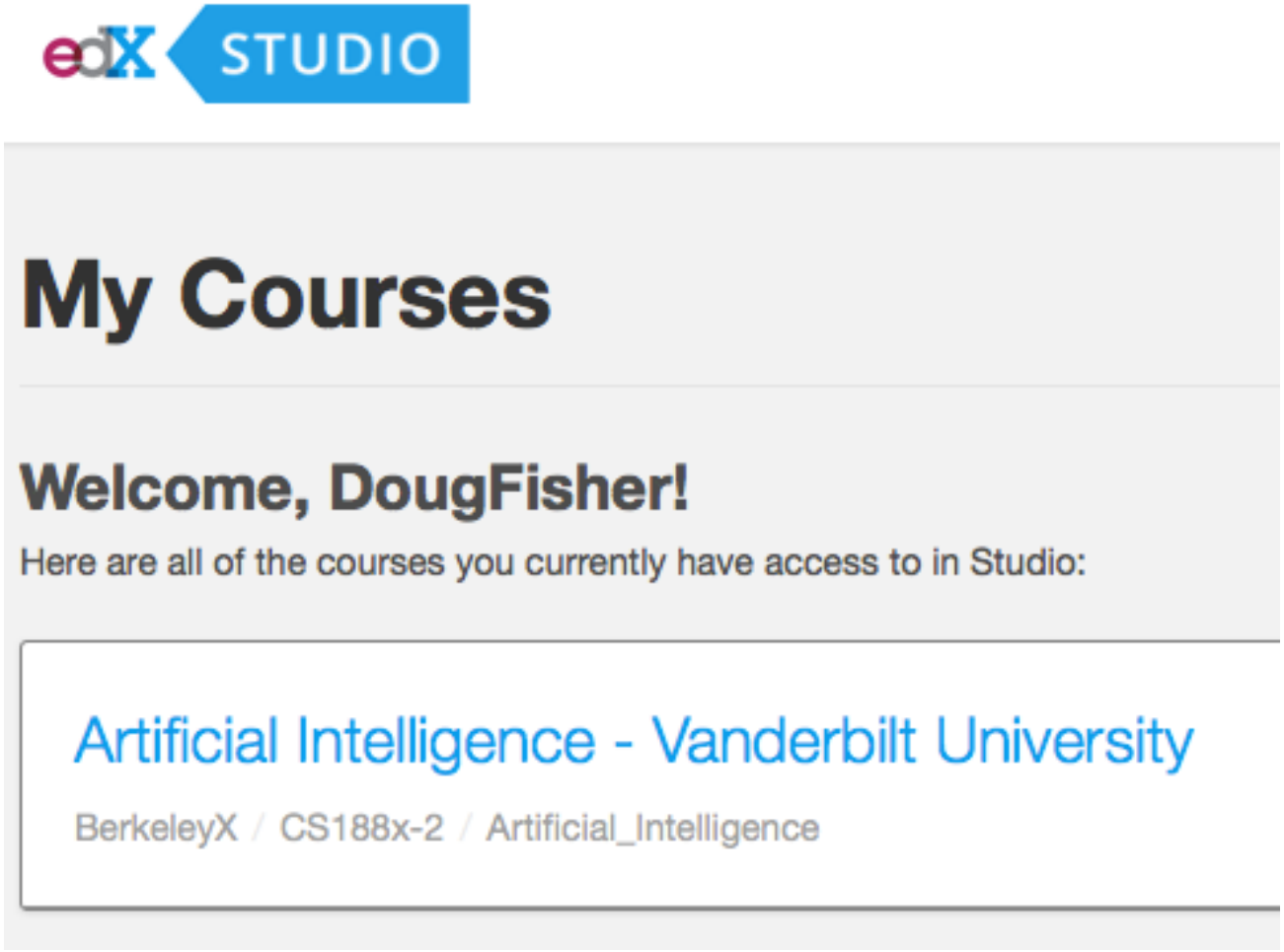
FAVORITES REMOVED
0 ●

Top 10 Videos

Browse all content

VIDEO	VIEWS ↓	ESTIMATED MINUTES WATCHED	LIKES
B+ Tree Basics 1	10,650	18,383	27
B+ Trees Basics 2 (insertion)	7,413	24,822	49

A course that feels like a collaborative effort



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Students and faculty can crowd-source textbook creation (here, an example of a lab text by "the community")

Artificial Intelligence for Computational Sustainability: A Lab Companion

Please see how you can contribute: Guide for Contributors

AI Chapters

Sustainability Chapters

http://en.wikibooks.org/wiki/Artificial_Intelligence_for_Computational_Sustainability:_A_Lab_Companion

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My video lectures have used slides, licensed for derivations, from course textbook site

artint.info/slides/slides.html

Most Visited Getting Started

ARTIFICIAL INTELLIGENCE

FOUNDATIONS OF COMPUTATIONAL AGENTS

Home | Complete Book | Resources | Slides

Next step (I hope): use nb to enable online annotation. Reinvigorate textbooks by making them environments/contexts for discourse

Slides

This page contains slides from David Poole and Alan Mackworth, *Artificial Intelligence: foundations of computational agents*, Cambridge University Press, 2010. All lecture materials are copyright © Poole and Mackworth, 2010 and are licensed under a Creative Commons Attribution-Noncommercial-Share Alike 2.5 Canada License.

These slides are in PDF format and can be read using the free acrobat reader or with recent versions of Ghostscript. You can get a zip file of the latest distribution of all of the slides that includes the sources. They were written using the LaTeX beamer class. To regenerate them you will also need the figures, and our beamer style file.

Authors

David Poole
Alan Mackworth

Douglas H. Fisher

nb is an annotation taking tool developed by the Haystack Group at CSAIL. Students and Faculty can use nb to annotate arbitrary PDF files online, in a collaborative fashion. nb.mit.edu/about/

The next Machine Learning course I teach will be drawn from multiple sources, including some of my own

Creative, Serious and Playful Science of Android Apps (UIUC)

Creative programing For digital media & Mobile Apps (U of London)

Software Defined Networks (U Maryland)

Functional Programming Principles in Scala (Ecole Polytechnique)

Image and Video (Duke)

Malicious Software underground story (U of London)

Heterogeneous Parallel Programming (Stanford)

Computational Photography (GaTech)

Web Intelligence and Big Data (IIT, Dehli)

Interactive

community

(Rice)

Crytography (Stanford)

Computer Vision (UC Berkeley)

Computer Vision (Stanford/Michigan)

Machine Learning (Stanford)

Machine Learning (U Washington)

Gamification (U Penn)

AI Planning (Edinburgh)

Applied Crytography (Udacity)

customization

(Melbourne)

NLP (Stanford)

Computing for Data Analysis (Johns Hopkins)

VLSI CAD: Logic to Layout (UIUC)

Networked Life (U Penn)

Social Network Analysis (Michigan)

Coding the Matrix: Linear Algebra CS applications (Brown)

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Some questions suggested from this experience

Educational Data Mining

- look beyond individual MOOCs, and mine data in a MOOC's "solar system" and beyond
- look for correlations between MOOC activity and other online content (e.g., Youtube, Wikipedia)
- intentional content creation (e.g., on Youtube) to fill MOOC gaps
- Other tracking of community growth

Benefits (or not) of MOOCs for on-campus education

- flipping the classroom; course design issues in wrapping a MOOC
- faculty engagement
- Local learning communities within global learning communities "the world is flat" – Thomas Friedman

Customization and Crowdsourcing

Micro-construct customization

- Lessons and courses

Macro-construct customization

- Curricula

Online Computer Science curricula can be customized
from courses that are free and online (this slide, some "Basic" courses)

Introduction to Logic (Stanford)

Combinatorics (Princeton)

October 2012

Learn to Program: Fundamentals (Toronto)	Introduction to Computer Science 1 (Harvard) and 2 (MIT)	CS 101 Introduction to Computer Science (Udacity)	Computer Science 101 (Stanford)

"equivalent" alternatives

Learn to Program: Crafting Quality Code (Toronto)	CS 212 Design of Computer Programs (Udacity)

"equivalent" alternatives

The Hardware/Software Interface (U Washington)

CS 215 Algorithms: Crunching Social Networks (Udacity)	Algorithms Part 1 (Princeton)	Algorithms: Design and Analysis, Part 1 (Stanford)

"equivalent" alternatives

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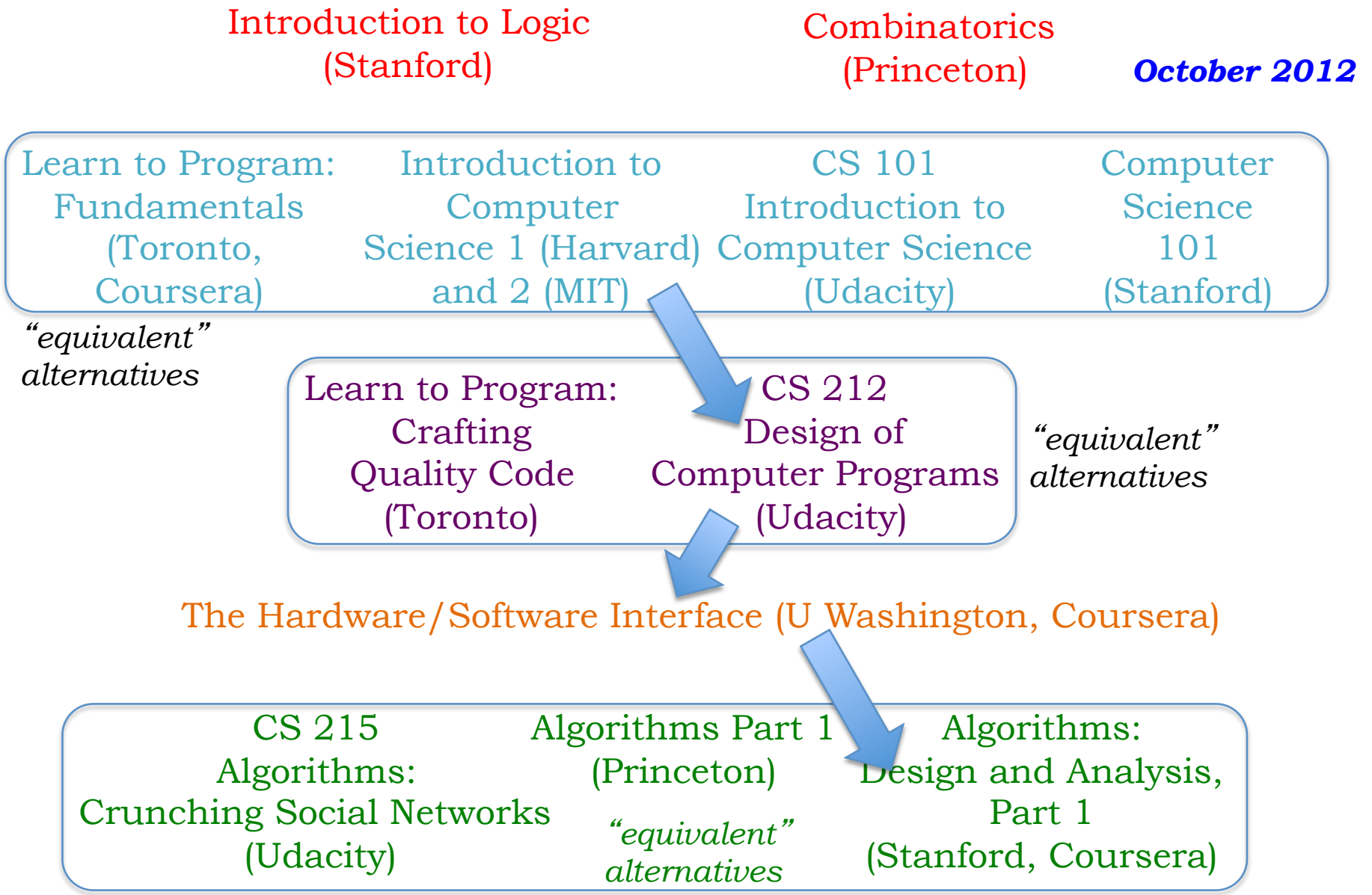
A plethora of resources enable customized curricula



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Opportunities

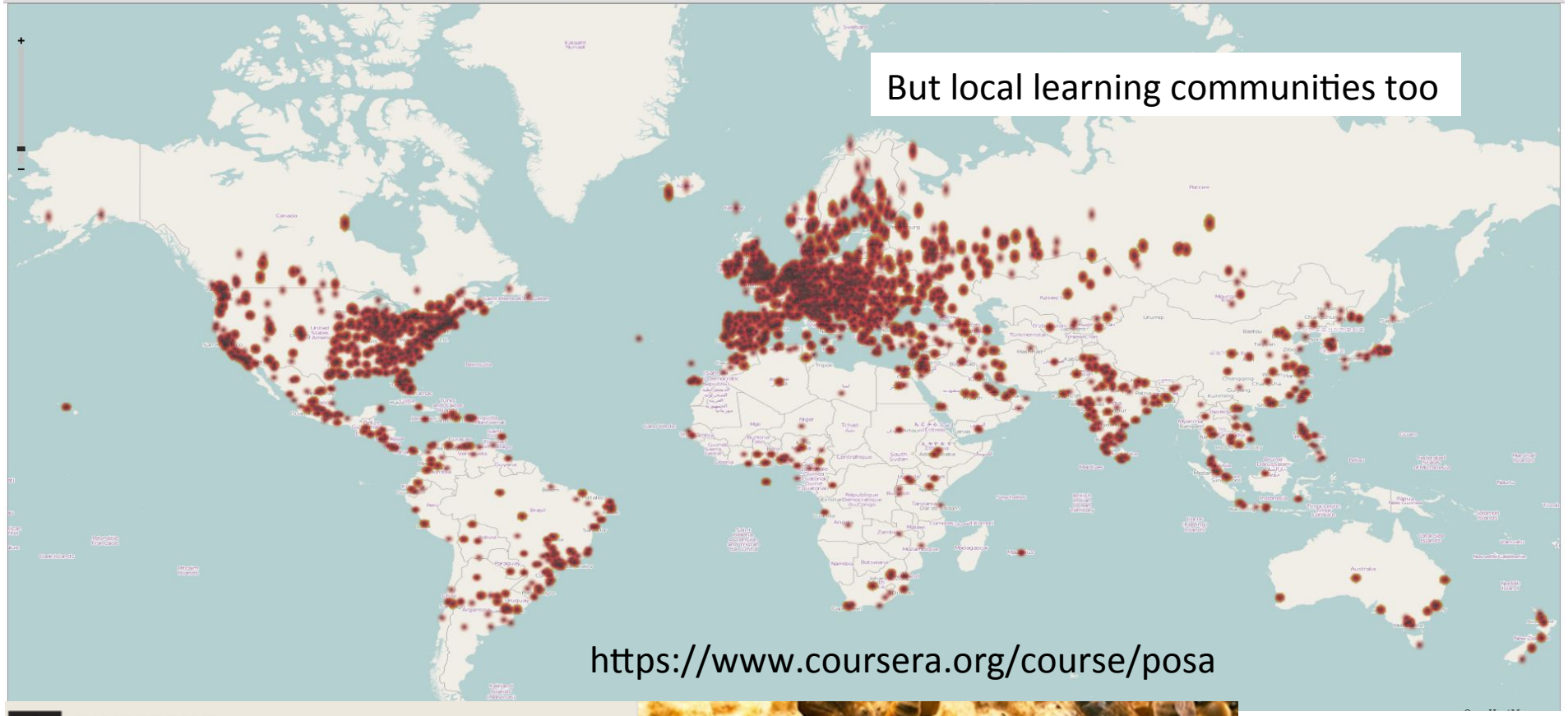
- Nascent steps towards crowd-sourced curricula

Vanderbilt University and University of Maryland join forces to offer MOOC sequence on mobile app development

by Melanie Moran | Posted on Monday, Sep. 9, 2013 — 7:00 AM

Professor of Computer Science Doug Schmidt films a video for Coursera. (Susan Urmy/Vanderbilt)

POSA Heat Map



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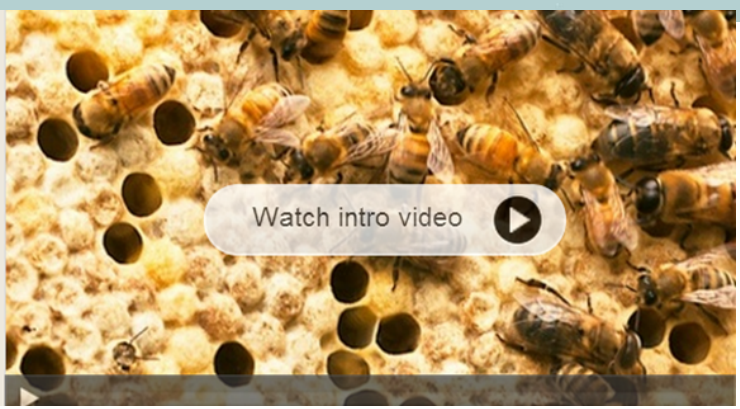
Pattern-Oriented Software Architectures for Concurrent and Networked Software



Adapted from Doug Schmidt

coursera | Global Partners Courses Partners About | Sign In Sign Up

https://www.coursera.org/course/onlinegames

VANDERBILT UNIVERSITY

Online Games: Literature, New Media, and Narrative

Jay Clayton

Focused on Tolkien and The Lord of the Rings Online, this course explores what happens to stories and films when they are turned into online games.

Workload: 4-6 hours/week

Taught In: English

Subtitles Available In: Eng

Hi Doug:

first 15 minutes

I can confirm that we have gone live. All of the settings are correct, and it appears that a thousand students have already entered the course (wow!)

Sessions:

Sep 9th 2013 (6 weeks long) Sign Up

Future sessions Add to Watchlist

814 Tweet 462 +1 7.7k Like

I can't even begin to tell you how excited I am for this class. Completely geeking out over here.

0 · flag

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- Commons Cup
- Commons Reading
- Crawford House
- East House
- Gillette House
- Hank Ingram House

College: Online Courses, Online Gaming and the One Ring

Posted by Kyla Terhune, Faculty Head of Hank Ingram House on September 3rd, 2013 at 12:38 pm

> "It is mine, I tell you. My own. My precious. Yes, my precious."
> – J.R.R. Tolkien, *The Fellowship of the Ring*

Part of Delbanco's work is an attempt to quantify where college goes from here – what does the future hold for higher education? One piece of that emerging story is online courses. Will ideas of Massively Open Online Courses be coupled with classroom instruction or maybe eventually supplant the live lecture?

To further our discussions of College this fall, let's explore online learning together. Starting Monday, Sept. 9th, through Coursera.org, Prof. Jay Clayton of Vanderbilt is offering "Online Games: Literature, New Media, and Narrrative." The course will discuss what happens to stories as they are turned into films and online games, focusing specifically on *The Fellowship of the Ring* by J.R.R Tolkien (along with the Peter Jackson movie and the MMORPG by Turbine). More information can be found here.

Register for the class by this Saturday, Sept. 8th (it's free) and email Hank Ingram Spouse of House Rick Keuler (rick.keuler@vanderbilt.edu) that you want to be involved. Hank's House will host movie viewing sessions required by the course and will help those that register secure copies of the reading if necessary. While

http://commonplace.vanderbilt.edu/?i=6856

A recurring theme:
local learning communities
embedded in global learning
community

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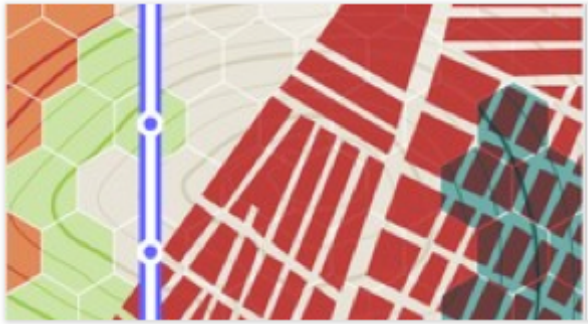
Opportunities

- Local learning communities embedded in global community
  … faculty and alums modeling lifelong learning



Maps and the Geospatial Revolution

Jul 17th — Aug 21st

Pennsylvania State University

Jul 17th (5 weeks long)

Go to class

View course info | Un-enroll

Steven Wenz @StevenWenz 16h

@derekbruff It would help me to show the growth of shanty towns around Buenos Aires since 2001 economic collapse. #vandymaps

In reply to Derek Bruff

View conversation

Derek Bruff @derekbruff 17h

Could be useful for humanities projects interested in showing change over time. Really nice interface. #vandymaps

Expand

Douglas H. Fisher @DougOfNashville 31 Jul

Waited to tweet about "On the Map" , #vandymaps, until after securing it from Nashville Library :-) n.pr/XilAQg #mapmooc

Favorited by Anthony Robinson

10s of 1000s of students Worldwide,

20 faculty, staff, students, alums, and two OSHER students at Vanderbilt

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Design Strategies for MOOCs

- Design MOOCs with local learning communities in mind, so that the designs of MOOCs and of local learning "architectures" co-evolve,
  - rather than simply relying on opportunistic, as-is use; to a great extent this is a lesson from the larger, pre-MOOC experience with online and blended learning

- Design MOOCs explicitly for course customization, with material intended to be reused, **remixed**, and revised (this seems a very novel suggestion).
  - Even those aspects of MOOCs that are consistent with remixing (e.g., short videos), are done for other reasons (e.g., student attention span), rather than with customization in mind *per se*

- Design MOOCs with research opportunities in mind, in areas such as educational data mining and human-computer interactions (though we are seeing more of this),
  - Rather than simply opportunistic, after-the-fact hypothesis generation

Strengths

- Disruption: undergraduate education in the national spotlight
- Disruption: made scales of openness and size explicit
- Changing Faculty Roles: active learning (flipping the class)
- Faculty must "up their game" (on the education side)
- Access to Higher Education (for those formally without)
- Branding and recruitment (for institutions and individuals)
- Proliferation of Online Content
  content creation and sharing by faculty and students
- Learning about learning
  educational data mining (which started before MOOCs)

Weaknesses

- High costs (time and money) to start up
- Non-uniform student population (prerequisite satisfaction)
- Many students isolated (apropos “drop-out” rates)

Processes and Costs

- Start-up costs, including studios (10s of $1000s)

- Course design (CfT) and pre-production
  reviewing for quality, copyright (library), cultural sensitivities

- Production
  - Monetary Costs (faculty release, supplements)
  - Iteration with course design

- Offering
  - Instructor involvement, TAs,
  - real-time revision of material

- Post Course assessment and revision and reoffering

"A general filmmaking rule I learned at Vandy, and have experienced in my own work, is that every minute of final video will require, at bare minimum, one hour of editing; i.e. a 10-minute video will take at least 10 hours to edit. I'd say that combining my and <the instructor's> effort on these videos will yield at least 300 hours of work" One of our dedicated videographers

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Opportunities

- Engaging alums, as lifelong learners, TAs, mentors, and instructors
  Non-uniform population not all bad, if planned for

- Recruiting help (TAs, tutors) through the online population
  (http://cloudandcampus.blogspot.com/2013/05/finding-best-teaching-assistant-in-world.html)

- Continuous improvement (using global population for feedback)

- Students can cheaply sample new subjects

- Across-institution created MOOCs (e.g., on Sustainability)

- Local learning communities (e.g., on campus courses)
  embedded in global community
  students directly benefitting from feedback
  student awareness of cultural differences
  student awareness of global competitiveness
  faculty and alums modeling lifelong learning

Opportunities

- Will computing technologies and educational expertise combined to promote *personalized learning at scale*, allow assessments (e.g., ABET), both "pre-visit" and "visit", to be done "**automatically**", while still

  - **thoroughly**
  - **consistently**
  - **efficiently**

in say, 10-20 years?

Technology will beg data collection and (perhaps) a deep infusion of Assessment! (e.g., see Vanderbilt's Knowledge Map:
http://knowledgemap.mc.vanderbilt.edu/research/content/knowledgemap-km-web-application

- Generally, ***increasing bang for the buck*** can involve

  - ***reducing the buck***, which is way above my pay-grade and currently very controversial

  - ***increasing the bang*** (e.g., MOOCs for lifelong and life-wide learning, involving campus students in global discourse), and often at my discretion (e.g., MOOCS to satisfy course prerequisites)

Threats

- Changing faculty roles: educational “factories”
- Quality control (poor quality broadcast to the World)
- Conflicts of commitment (unbundled universities)
- Cheating
- The demise of textbooks (but see text annotation tools)
- Intellectual property

List of Courses that used MOOC material

https://my.vanderbilt.edu/cs260/ Undergraduate AI … used lecture material from Web, including my own

https://my.vanderbilt.edu/cs360fall2012/ Graduate AI … no MOOC material per se, but students required to produce a video lecture on undergraduate AI content of a Tutorial nature

https://my.vanderbilt.edu/cs390fall2012/ Graduate Machine Learning course, true wrapper, requiring satisfaction of COURSERA/Stanford MOOC course and additional reading and project

https://my.vanderbilt.edu/cs265/ Undergraduate Database, using COURSERA/Stanford Lectures (required in S12, now optional, waiting to see how user agreements settle out)

Other Links

YouTube channel of my online content:
https://www.youtube.com/channel/UCWOFdpEfNuQP3O_JUiwhT8A?feature=mhee

A narrative summary of my experience "Warming up to MOOCs" http://chronicle.com/blogs/profhacker/warming-up-to-moocs/44022

Workshop on Multidisciplinary Research for Online Education: http://www.cra.org/ccc/visioning/visioning-activities/online-education/286-multidisciplinary-research-for-online-education-workshop

Bruff, D., Fisher, D., McEwen, K., & Smith, B. (in press) "Wrapping a MOOC: student perceptions of an experiment in blended learning." Journal of Online Learning and Teaching. https://my.vanderbilt.edu/douglasfisher/files/2013/06/JOLTPaperFinal6-9-2013.pdf

Learning on Campus and in the Cloud blog: http://cloudandcampus.blogspot.com/

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