Changing Models of Education – Teaching Data Science as a Case Study

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What are the issues?

- A little about my perspective
- Motivation for Data Science as a case study

- What's wrong with the traditional classroom?
  - What are the alternatives?

- What's happening to educational programs?
  - Are MOOCs, online programs, and stackable degrees taking over?

- Challenges and my personal opinions

A little about my perspective…

- Training and experience in teaching

- Bystander in the data science revolution
- Developing flipped and online classrooms
- Member of educational committees

- A participant in, not an expert on the process

"I know nothing about the subject,
but I'm happy to give you my expert opinion."

Why Data Science?

Harvard Business Review

ARTWORK: TAMAR COHEN, ANDREW J BUBOLTZ, 2011, SILK SCREEN ON A PAGE FROM A HIGH SCHOOL YEARBOOK, 8.5" X 12"

DATA

Data Scientist: The Sexiest Job of the 21st Century

by Thomas H. Davenport and D.J. Patil

FROM THE OCTOBER 2012 ISSUE

WHAT TO READ NEXT

Big Data: The Management Revolution

https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century

Data Scientist Is the Best Job In America According Glassdoor's 2018 Rankings

https://www.forbes.com/sites/louiscolumbus/2018/01/29/data-scientist-is-the-best-job-in-america-according-glassdoors-2018-rankings/#b52f1c755357

http://pitt.libguides.com/c.php?g=12233&p=65121

To discuss changing models of education… Let's go back to the beginning…

- Sage on Stage
- Teaching by Telling
- Notes in one hand, chalk in the other

https://www.learneroo.com/modules/9/nodes/97

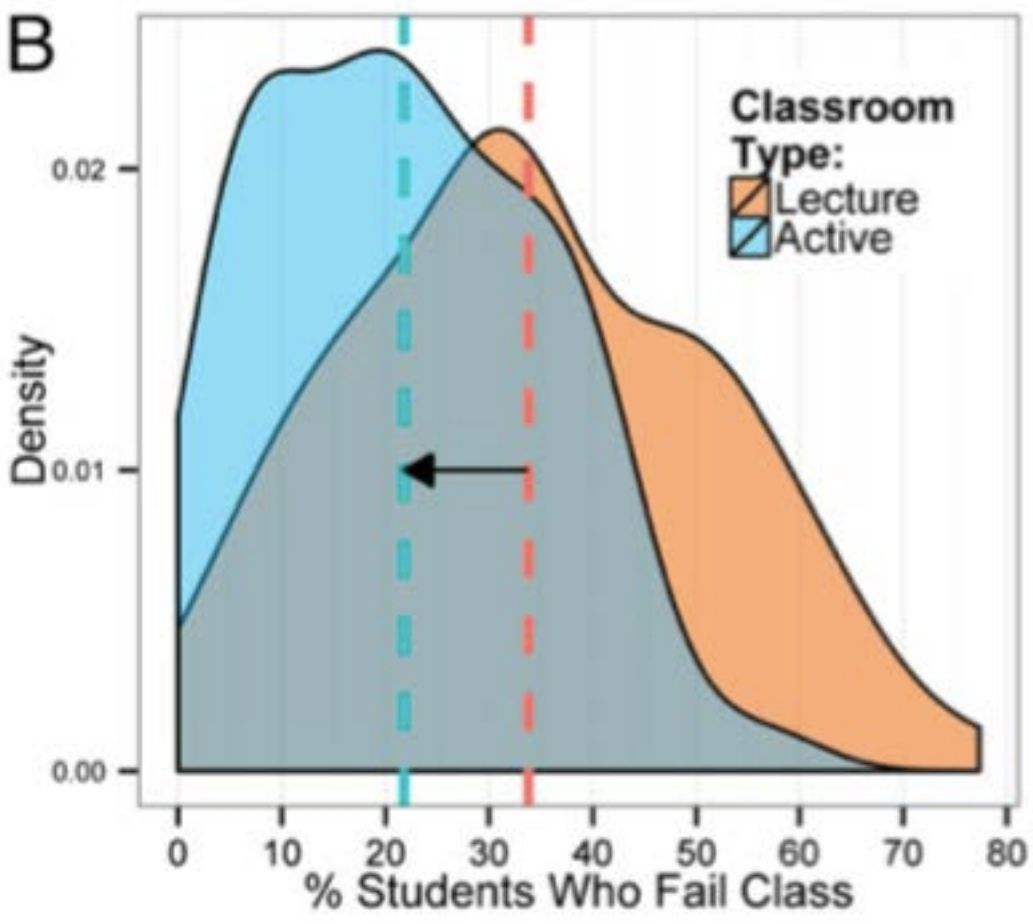
What's wrong with the 'sage on the stage' approach?

Blah? Traditional lecture classes have higher undergraduate failure rates than those using active learning techniques, new research finds. WIKIMEDIA

Lectures aren't just boring, they're Ineffective, too, study finds

By Aleszu Bajak | May. 12, 2014 , 3:00 PM

http://www.sciencemag.org/news/2014/05/lectures-arent-just-boring-theyre-ineffective-too-study-finds



http://www.pnas.org/content/pnas/111/23/8410.full.pdf

What do we mean by active learning?

- Flipped classroom
  - ‘Lectures’ are outside of class
  - ‘Homework’ is done inside of class
- Problem-based learning
  - Self-directed learning in small groups investigating cases
  - Open-ended questions drive learning from presentation to resolution
- Process Oriented Guided Inquiry Learning (POGIL)
  - Process skills incorporated through structured activities
  - Exploration of a model, leading to the concept, followed by application

https://www.chronicle.pitt.edu/story/turning-classroom-upside-down-good

http://www.springerpub.com/the-health-professions-educator.html

https://serc.carleton.edu/sp/library/pogil/what.html

Example of the Flipped Classroom

- Comparative Effectiveness Research (CLRES 2107)
- Outside of class: content from videos/articles

pcori Patient-Centered Outcomes Research Institute

- During class: project-based exercises in groups

EXPANDING NATIONAL CAPACITY ENACT IN PCOR THROUGH TRAINING

https://www.icre.pitt.edu/ENACT/index.aspx

https://cer.extensiononline.ucdavis.edu
https://www.pcori.org/research-results/about-our-research/research-methodology/methodology-standards-academic-curriculum

How might this work for Data Science?

- Same challenges as a traditional course
  - Objectives, prerequisites, software, projects
- Assemble available resources
  - Stress videos + reading assignments, textbook
- Decide on a strategy for classroom activities
  - Programming, group or individual project
  - May need a team of instructors and facilitators

What about the educational landscape?

- Massively Open Online Classes (MOOCs)
- Online degree programs and universities
- Stackable degrees

Educational Issues in Data Science

Curriculum Guidelines for Undergraduate Programs in Data Science

https://www.annualreviews.org/doi/full/10.1146/annurev-statistics-060116-053930

There are thousands of online courses…

https://medium.freecodecamp.org/i-ranked-all-the-best-data-science-intro-courses-based-on-thousands-of-data-points-db5dc7e3eb8e

- Coursera has a 9-course specialization
- Many related MOOCs
- Online and in-person degrees from public, private & for-profit universities
- Stackable degrees

https://www.coursera.org/specializations/jhu-data-science

Strategies

- Enhance the curriculum
- Serve as a leader in personalizing educational experiences
- Enrich the student experience
- Promote access and affordability

There are significant barriers

Resources exist

University of Pittsburgh

Pitt | UNIVERSITY CENTER FOR TEACHING AND LEARNING

COURSE INCUBATOR

LARGE ENROLLMENT

Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

Researcher Training and Workforce Development in Methods and Standards for Conducting Patient-Centered Health Outcomes Research Studies

AHRQ Training Projects Funded by PCOR Trust Fund

Advisory Council on Instructional Excellence

Innovation in Education Awards

BD2K Open Educational Resources for Skills Development in Biomedical Big Data Science (R25)

A few closing suggestions…

- Changing models of education present many challenges
- Many options – one size does not fit all
- Implementation takes time and may take a team (and funding)
- Each faculty has to assess pros and cons
- If it was easy, every institution could do it well

Comments welcome!

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