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
Why Data Science?

Data Scientist: The Sexiest Job of the 21st Century
by Thomas H. Davenport and D.J. Patil
FROM THE OCTOBER 2012 ISSUE


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


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?

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
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
  
  ![Comparative Effectiveness](http://www.pcori.org/research-results/about-our-research/research-methodology/methodology-standards-academic-curriculum)

• During class: project-based exercises in groups
  
  ![pcori](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
There are thousands of online courses...

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

Educational Issues in Data Science

Curriculum Guidelines for Undergraduate Programs in Data Science


GOAL 1: Advance Educational Excellence

We aspire to be a university that prepares students to lead lives of impact through a supportive environment focused on a holistic and individualized approach to learning inside and outside the classroom.

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

**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

**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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