

# Experiences Teaching an Introductory Statistics MOOC

Alison L. Gibbs

[alison.gibbs@utoronto.ca](mailto:alison.gibbs@utoronto.ca)

ICOTS 9  
2014



Statistical Sciences  
UNIVERSITY OF TORONTO

What is a MOOC?

# Massive Open Online Course

What is a MOOC?

# Massive Open Online Course

Disruptive innovation or a passing fad?

## What is a MOOC?

# Massive Open Online Course

Disruptive innovation or a passing fad?

**The New York Times**

**The Year of the MOOC**

Published: November 2, 2012

## What is a MOOC?

# Massive Open Online Course

Disruptive innovation or a passing fad?

**The New York Times**

**The Year of the MOOC**

Published: November 2, 2012

**The Washington Post**

**Are MOOCs already over?**

December 12, 2013

## What is a MOOC?

# Massive Open Online Course

Disruptive innovation or a passing fad?

**The New York Times**

**The Year of the MOOC**

Published: November 2, 2012

**The Washington Post**

**Are MOOCs already over?**

December 12, 2013

**Slate**

**The Death of MOOCs Has  
Been Greatly Exaggerated**

APRIL 29 2014

# A Brief History of MOOCs

- 2008 “MOOC” coined for a course in connectivist knowledge
- 25 University of Manitoba students
  - 2000 learners world-wide taking course for free, no credit

# A Brief History of MOOCs

2008 “MOOC” coined for a course in connectivist knowledge

- 25 University of Manitoba students
- 2000 learners world-wide taking course for free, no credit

end of 2011 3 Stanford Computer Science MOOCs

Total enrolment over 300,000



# A Brief History of MOOCs

2008 “MOOC” coined for a course in connectivist knowledge

- 25 University of Manitoba students
- 2000 learners world-wide taking course for free, no credit

end of 2011 3 Stanford Computer Science MOOCs

Total enrolment over 300,000

April 2012 Coursera MOOC provider launched

July 2012 University of Toronto partners with Coursera

Fall 2012 Bill & Melinda Gates Foundation funds development of several MOOCs

Spring 2013 *Statistics: Making Sense of Data* offered on Coursera  
co-taught by me and Jeffrey Rosenthal

# A Brief History of MOOCs

- 2008 “MOOC” coined for a course in connectivist knowledge
- 25 University of Manitoba students
  - 2000 learners world-wide taking course for free, no credit

end of 2011 3 Stanford Computer Science MOOCs

Total enrolment over 300,000

April 2012 Coursera MOOC provider launched

July 2012 University of Toronto partners with Coursera

Fall 2012 Bill & Melinda Gates Foundation funds development of several MOOCs

Spring 2013 *Statistics: Making Sense of Data* offered on Coursera  
co-taught by me and Jeffrey Rosenthal

cMOOC emphasize connected learning

xMOOC instructor-driven,  
focus on transmitting rather than constructing knowledge,  
scalable to any number of learners

## Disruptive innovation for higher education?

*“By making high quality education available to anyone with internet access, edX hopes to democratize education, transform lives worldwide, and reinvent campus education.”*

– edX spokesperson

# Disruptive innovation for higher education?

*“By making high quality education available to anyone with internet access, edX hopes to democratize education, transform lives worldwide, and reinvent campus education.”*

– edX spokesperson

- anyone can participate
  - any educational background
  - any part of the world
  - access to courses from prestigious universities
  - free (not really ...)
- indefinitely scalable
- rely on peer support through social networking
- provide data that can be mined for understanding learning
- can improve the quantity and quality of student-teacher interactions

# Why Teach a MOOC?

*University of Toronto:*

- share expertise through open educational resources
- showcase institution
- leverage resources into on-campus offerings
- conduct research

# Why Teach a MOOC?

## *University of Toronto:*

- share expertise through open educational resources
- showcase institution
- leverage resources into on-campus offerings
- conduct research

## *Bill & Melinda Gates Foundation:*

- expand to a broader range of learners and courses than existing MOOCs
- learn for what disciplines and types of learners the MOOC format may be most successful
- learn what data are necessary to support improvements in learning

# Why Teach a MOOC?

## *University of Toronto:*

- share expertise through open educational resources
- showcase institution
- leverage resources into on-campus offerings
- conduct research

## *Bill & Melinda Gates Foundation:*

- expand to a broader range of learners and courses than existing MOOCs
- learn for what disciplines and types of learners the MOOC format may be most successful
- learn what data are necessary to support improvements in learning

## *For us:*

- a sandbox

## *Statistics: Making Sense of Data*

The course:

- introductory post-secondary statistics compressed into 8 weeks
- no calculus pre-requisite
- 41 short (6-25 minutes) lecture videos, 22 optional R tutorials
- weekly machine-graded quiz, two peer-assessed assignments
- students could earn a Statement of Accomplishment on completion



# *Statistics: Making Sense of Data*

The course:

- introductory post-secondary statistics compressed into 8 weeks
- no calculus pre-requisite
- 41 short (6-25 minutes) lecture videos, 22 optional R tutorials
- weekly machine-graded quiz, two peer-assessed assignments
- students could earn a Statement of Accomplishment on completion

Our goals:

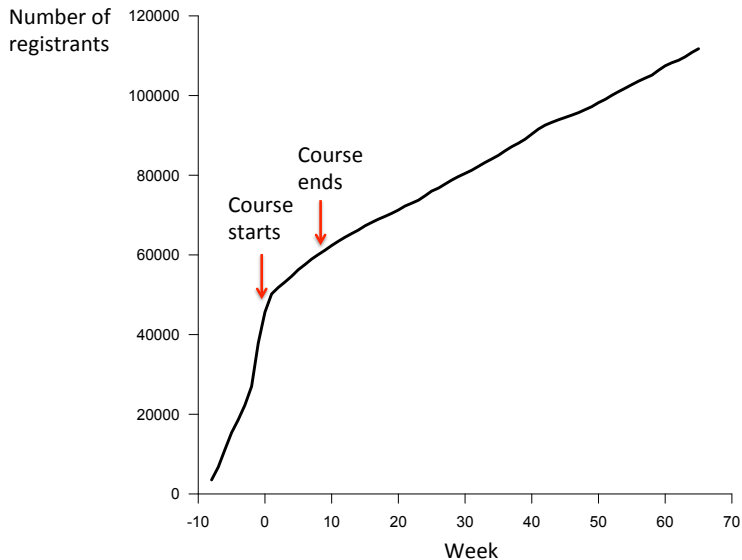
- dynamic lecture videos
- interesting data, preferably with which we had personal connections
- no barriers to a Statement of Accomplishment for learners who did the work

## *Statistics: Making Sense of Data*

Pedagogical framework provided by Coursera:

- learn at own pace
- emphasis on mastery learning
- frequent evaluation and feedback so learners can monitor their own learning
- machine grading and peer assessment
- community building and peer-to-peer engagement through:
  - discussion forums
  - course wiki
  - local meet-ups

# The “M” in MOOC



# The Learners

Based on IP addresses:

- 201 different countries
  - 31% United States
  - 13% India

Based on pre-course survey (completed by 17,500 learners):

- 62% male
- Average age approximately 35 years
- English was not the first language for 73%
- 88% already completed a university degree,  
46% had a postgraduate degree
- 74% had some background in statistics

# The Learners

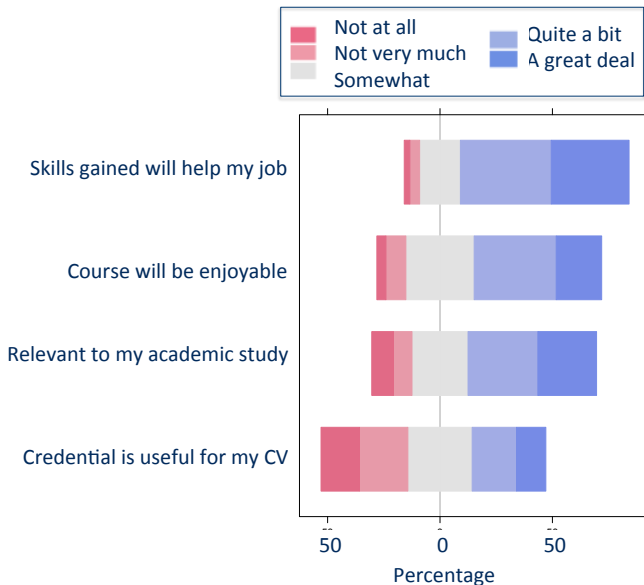
Based on IP addresses:

- 201 different countries
  - 31% United States
  - 13% India

Based on pre-course survey (completed by 17,500 learners):

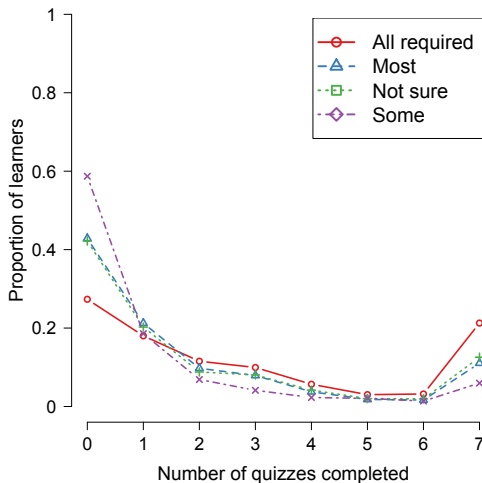
- 62% male
- Average age approximately 35 years
- English was not the first language for 73%
- 88% already completed a university degree, 46% had a postgraduate degree
- 74% had some background in statistics
- **Intent:** 77% planned to complete all of the requirements for a Statement of Accomplishment

# The Learners



# Learner progress through the MOOC:

## Number of quizzes completed by intended work



# Completion and Persistence

How should we measure achievement?



# Completion and Persistence

How should we measure achievement?

- 5% of learners enrolled earned a Statement of Accomplishment.

# Completion and Persistence

How should we measure achievement?

- 5% of learners enrolled earned a Statement of Accomplishment.
- But half of the registrants never showed up.

# Completion and Persistence

How should we measure achievement?

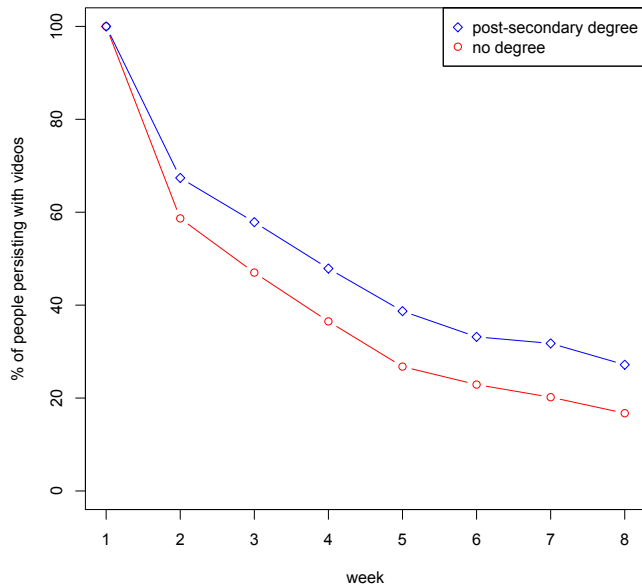
- 5% of learners enrolled earned a Statement of Accomplishment.
- But half of the registrants never showed up.
- Of the learners who completed the first quiz, 26% completed the final quiz.

# Completion and Persistence

How should we measure achievement?

- 5% of learners enrolled earned a Statement of Accomplishment.
- But half of the registrants never showed up.
- Of the learners who completed the first quiz, 26% completed the final quiz.
- Of the learners who watched a video in week 1, 39% watched a video in week 8.

# Factors Associated with Completion and Persistence



# Factors Associated with Completion and Persistence

Factors associated with learners who were more likely to earn a Statement of Accomplishment and persist with quizzes and videos:

- **Intent:**

- intend to work towards a Statement of Accomplishment
- intend to spend more time on the course

- **Ability:**

- higher score on background knowledge quiz

- **Demographics:**

- college graduate
- older
- from Australia or Europe
- first language not English
- male (video persistence only)

# Learning from the click log

# Learning from the click log

## Taxonomy of MOOC Learners (Anderson *et al.* (2014))

**Viewers** watch lectures; complete few, if any, evaluations

**Solvers** complete evaluations; watch few lectures

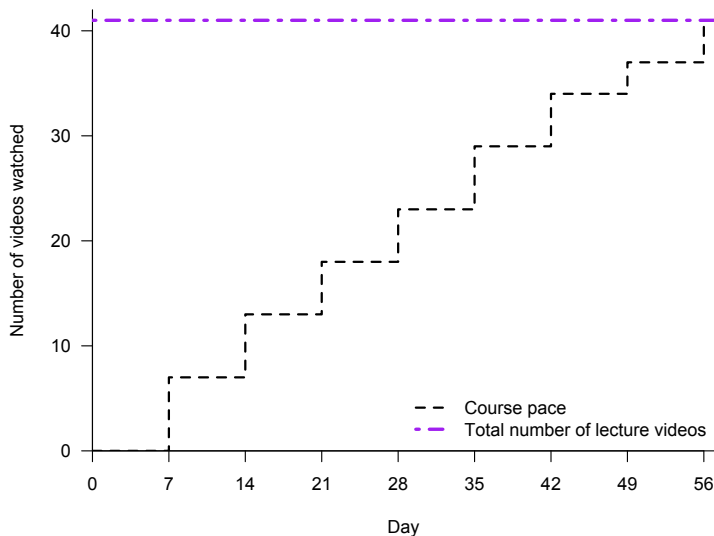
**All-Rounders** watch lectures and complete evaluations

**Collectors** download lectures

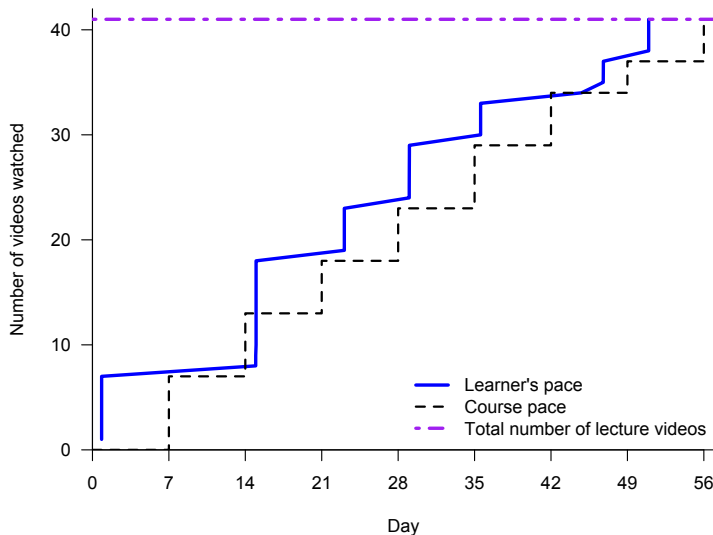
**Bystanders** register but very little activity



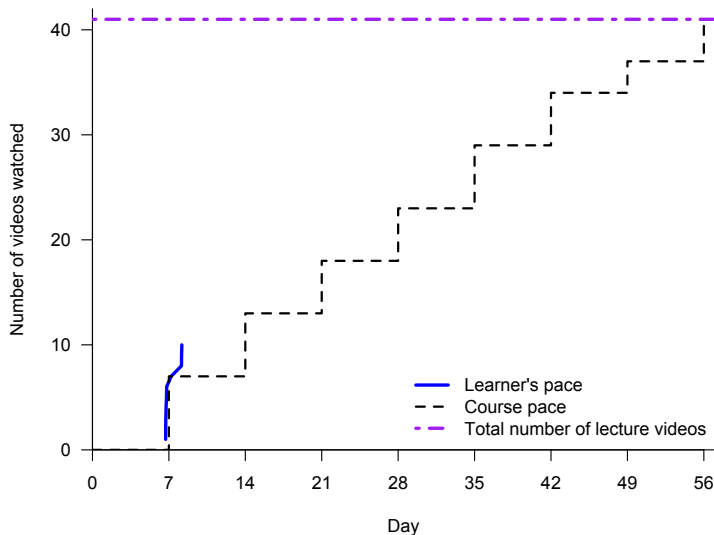
# Learner progress through the MOOC: Watching videos



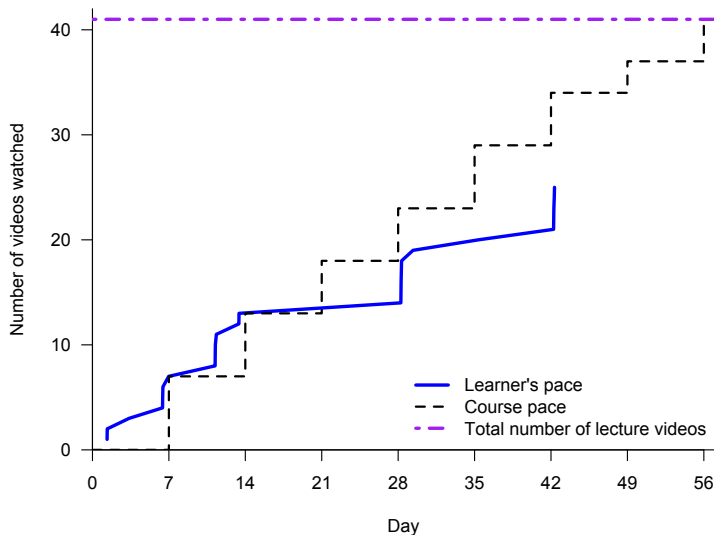
# Learner progress through the MOOC: Watching videos



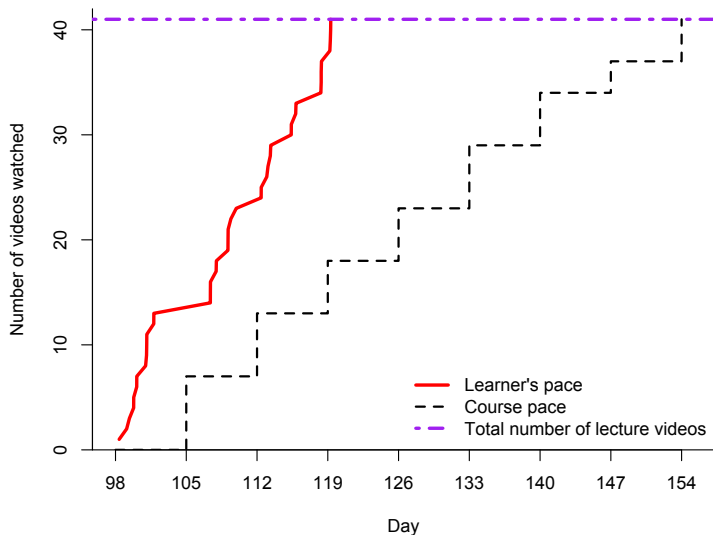
# Learner progress through the MOOC: Watching videos



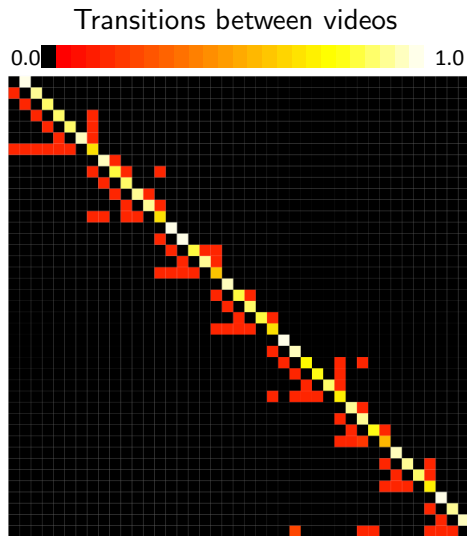
# Learner progress through the MOOC: Watching videos



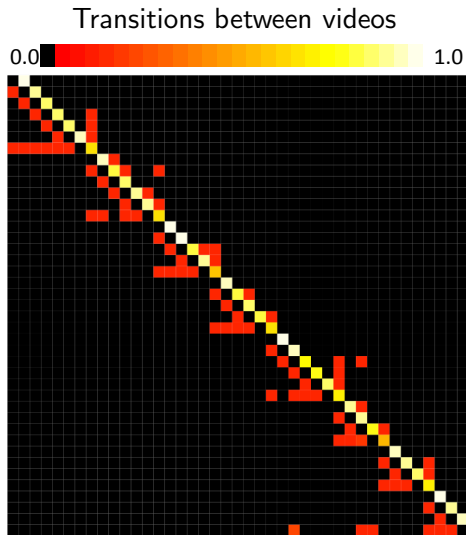
# Learner progress through the MOOC: Watching videos



# Learner interaction with course materials



# Learner interaction with course materials



Sequencing of learner activity:

- Between re-attempting a quiz, 30% of learners accessed a lecture video, 10% visited the forums.

# The Future?

What can we conclude?

- There is a huge, global demand from well-educated learners who are passionate about open access to learning opportunities.
- Is the value of MOOCs as learning resources, rather than stand-alone courses?
  - a tool for adult learners
  - another option for our on-campus students
  - corporate training and professional development



# The Future?

What can we conclude?

- There is a huge, global demand from well-educated learners who are passionate about open access to learning opportunities.
- Is the value of MOOCs as learning resources, rather than stand-alone courses?
  - a tool for adult learners
  - another option for our on-campus students
  - corporate training and professional development

Opportunities for MOOC development:

- better strategies for engaging learners in discussion
- make better use of technology, for example develop tools for adaptive learning
- offer flexible start times, exit points, level of depth
- Investigate the question: “But did they learn?”

# The Future?

What can we conclude?

- There is a huge, global demand from well-educated learners who are passionate about open access to learning opportunities.
- Is the value of MOOCs as learning resources, rather than stand-alone courses?
  - a tool for adult learners
  - another option for our on-campus students
  - corporate training and professional development

Opportunities for MOOC development:

- better strategies for engaging learners in discussion
- make better use of technology, for example develop tools for adaptive learning
- offer flexible start times, exit points, level of depth
- Investigate the question: “But did they learn?”

*Thank you!*

Teaching a MOOC