



Demographics and Learner Behavior in MITx and HarvardX MOOCs

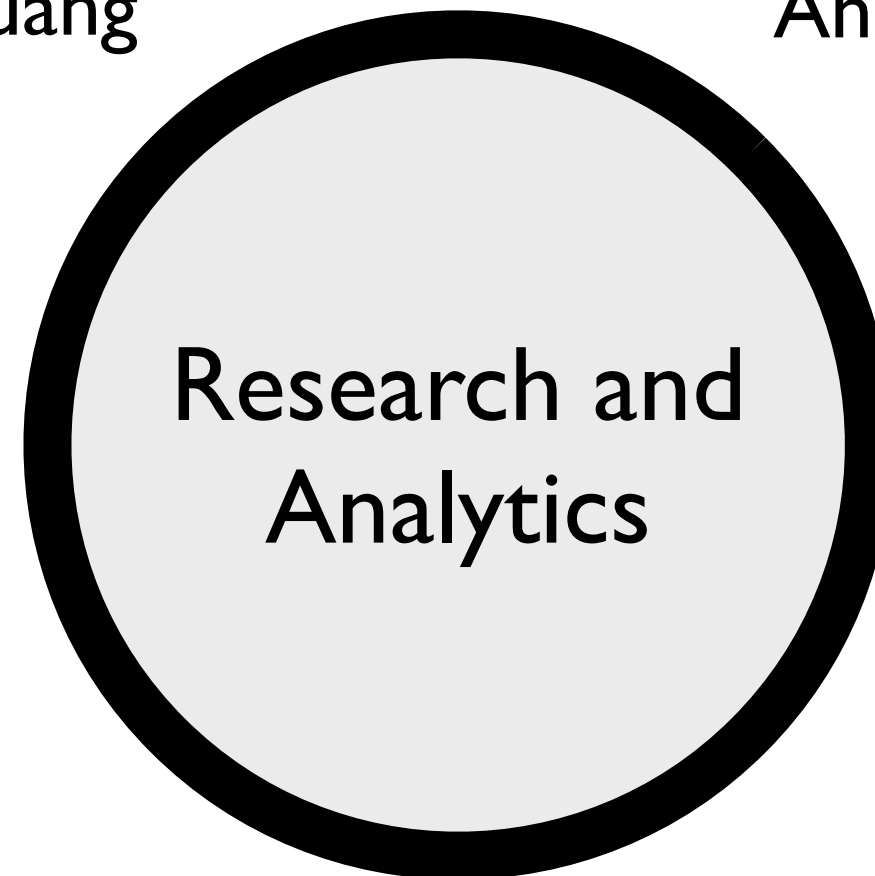
HHMI Education Group - March 2014

Collaborators



HarvardX

Isaac Chuang
Daniel Seaton
Cody Coleman
Curtis Northcutt



Andrew Ho
Sergiy Nesterko
Justin Reich
Tommy Mullaney



Miki Goyal Olga Stroilova Carlos Rocha
Gabe Mulley Brian Wilson

MITx (26 Courses)

HarvardX (24 Courses)

8.MReVx: Mechanics ReView

Mechanics ReView presents a college-level introductory mechanics class using a strategic problem-solving approach.

STARTS: 1 Jun 2013 INSTRUCTORS: David E. Pritchard MITx

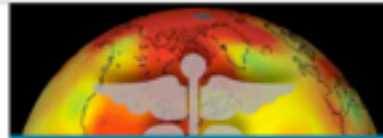


[learn more](#)

PH278x: Human Health and Global Environmental Change

PH278x explores global environmental changes, examining their causes as well as their health consequences, and engages students in thinking about their solutions.

STARTS: 15 May 2013 INSTRUCTORS: A. Bernstein, J. Spe... HarvardX



[learn more](#)

2.01x: Elements of Structures

A first course on mathematical modeling of structures and the mechanical behavior of deformable structural elements.

STARTS: 15 April 2013 INSTRUCTORS: Simona Socrate MITx



[learn more](#)

CB22x: The Ancient Greek Hero

A survey of ancient Greek literature focusing on classical concepts of the hero and how they can inform our understanding of the human condition.

STARTS: 13 Mar 2013 INSTRUCTORS: G. Nagy, L. Muellner... HarvardX



[learn more](#)

6.002x: Circuits and Electronics

Teaches the fundamentals of circuit and electronic analysis.

STARTS: 20 March 2013 INSTRUCTORS: Anant Agarwal MITx

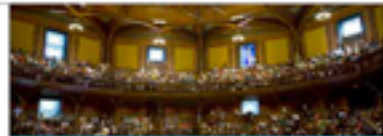


[learn more](#)

ER22x: Justice

Justice is an introduction to moral and political philosophy, including discussion of contemporary dilemmas and controversies.

STARTS: 2 Mar 2013 INSTRUCTORS: Michael J. Sandel HarvardX

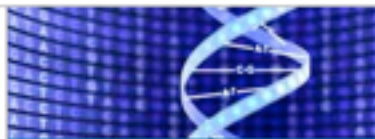


[learn more](#)

7.00x: Introduction to Biology - The Secret of Life

Explore the secret of life through the basics of biochemistry, genetics, molecular biology, recombinant DNA, genomics and rational medicine.

STARTS: 3 March 2013 INSTRUCTORS: Eric S. Lander MITx

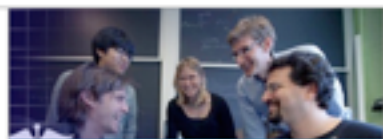


[learn more](#)

PH207x: Health in Numbers: Quantitative Methods in Clinical ...

PH207x is the online adaptation of material from the Harvard School of Public Health's classes in epidemiology and biostatistics.

STARTS: 15 Oct 2012 INSTRUCTORS: E. F. Cook, M. Pagan... HarvardX



[learn more](#)


- Massive Open Online Courses (MOOCs)
- Both HarvardX and MITx have ~ 1M registrants each.
- Roughly 50K unique resource identifiers (*needs to be updated*)
- None of this possible without the dedication of course teams.

Insights: *Interactive Visualizations*

harvardx.harvard.edu/harvardx-insights

HOME / DATA & RESEARCH /

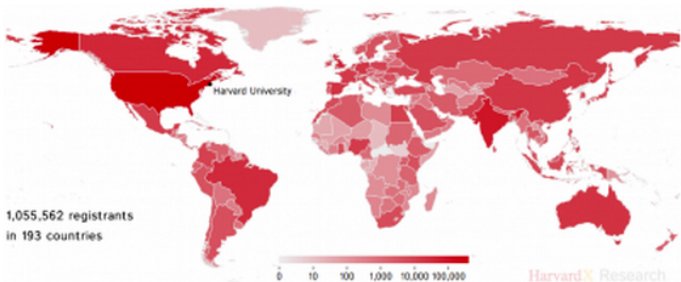
HarvardX Insights



HarvardX Insights is a collection of interactive visualizations of data on all HarvardX offerings which dynamically update at frequent, regular intervals.

For questions or feedback, please contact
Sergiy Nesterko sergiy_nesterko@harvard.edu (HarvardX Research Fellow).

1. [World map of enrollment](#)



MITx Insights: <http://odl.mit.edu/insights/>

HarvardX Insights: <http://harvardx.harvard.edu/harvardx-insights>

Course Reports / Working Papers

MITx Working Papers

#'s 2 through 12

3.091x Introduction to Solid-State Chemistry – Fall 2012 MITx Course Report

(MITx Working Paper #2)

6.00x Introduction to Computer Science and Programming – Fall 2012 MITx Course Report

(MITx Working Paper #3)

6.002x: Circuits and Electronics – Fall 2012 MITx Course Report

(MITx Working Paper #4)

2.01x Elements of Structures – Spring 2013 MITx Course Report

(MITx Working Paper #5)

3.091x Introduction to Solid-State Chemistry – Spring 2013 MITx course report

(MITx Working Paper #6)

6.00x Introduction to Computer Science and Programming – Spring 2013 MITx Course Report

(MITx Working Paper #7)

6.002x: Circuits and Electronics – Spring 2013 MITx Course Report

(MITx Working Paper #8)

7.00x Introduction to Biology: The Secret of Life – Spring 2013 MITx Course Report

(MITx Working Paper #9)

8.02x Electricity and Magnetism – Spring 2013 MITx Course Report

(MITx Working Paper #10)

14.73x: The Challenges of Global Poverty - Spring 2013 MITx Course Report

(MITx Working Paper #11)

8.MReV: Mechanics ReView – Summer 2013 MITx Course Report

(MITx Working Paper #12)

HarvardX Working Papers

#'s 2 through 6

▼ HarvardX Working Papers
1. HarvardX and MITx: The First Year of Open Online Courses
2. PH207x: Health in Numbers and PH278x: Human Health and Global Environmental Change
3. CB22x: HeroesX
4. ER22x: JusticeX
5. HLS1X: CopyrightX

<http://odl.mit.edu/mitx-working-papers/>

Cross-Course Synthesis

HarvardX and MITx: The First Year of Open Online Courses Fall 2012-Summer 2013



- HarvardX and MITx Working Paper #1
- Collaboration between HarvardX Research Committee and the Office of Digital Learning at MIT
- Research findings challenge common misconceptions, offer surprising insights about how students engage with MOOCs

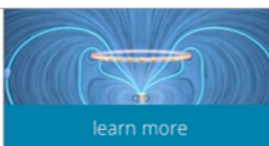
Key Takeaways:

1. Courses are very different.
2. Registrant diversity is immense compared to residential.
3. Equal diversity in terms of participation.

* Ho, A. D., et al. (2014). *HarvardX and MITx: The first year of open online courses* (HarvardX and MITx Working Paper No. 1).

Outline

- Introduction
- Key points from MITx and HarvardX course reports
 - Variation in Courses.
 - Registrant Diversity.
 - All MOOC registrants should “not” be labeled as traditional students
- Participant Behavior
- Do demographics impact behavior?



Courseware

Updates

Course Info

Textbook

Download PDFs

Calendar

Discussion

Wiki

Progress

Instructor

Staff view

Introduction

Week 1

Week 2

Week 3

Week 4

Midterm 1

Week 5

Lecture 13: Moving Charges
in Magnetic Fields

Lecture



Lecture 14: Biot-Savart Law

Lecture



Lecture 15: Ampere's Law

Lecture



Problem Solving

Problem Solving

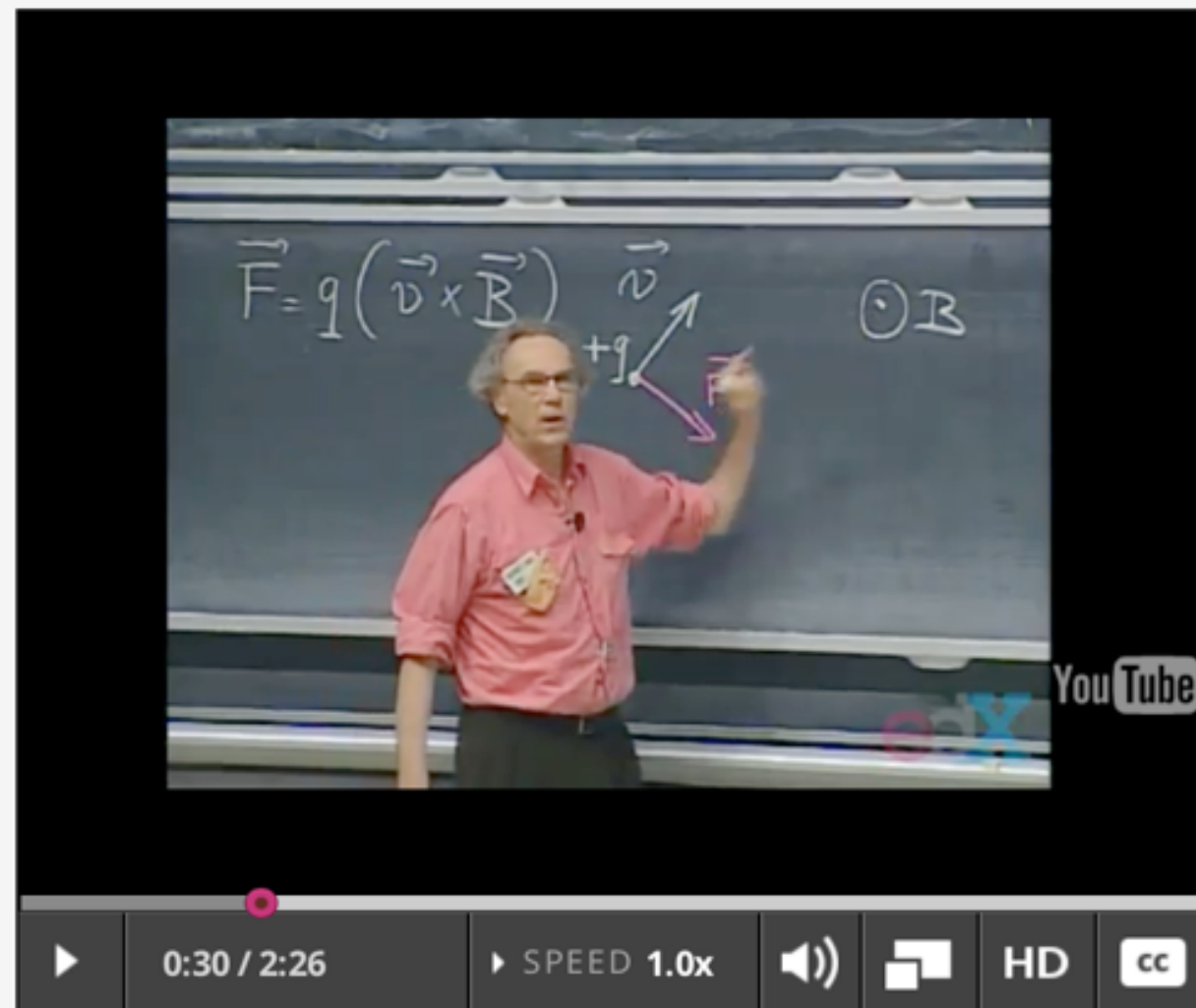
HW4

Homework due Apr 03, 2013 at
23:59 UTC

Ampere's Law Simulation

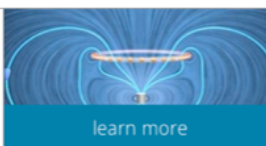
TEALsim due Apr 03, 2013 at
23:59 UTC

LECTURE 13 VIDEO SEGMENT 2



Download video

positive charge, $+q$, and it has a velocity, v , in this direction, and the magnetic field would be uniform and coming out of the blackboard, there's going to be a force on this charge, according to this relationship, and the force is then like so, perpendicular to \vec{v} , perpendicular to \vec{B} . In this case, the charged particle is going to go around in a circle. The Lorentz force cannot change the speed, cannot change the kinetic energy because the force is always perpendicular to the velocity, but it can change the direction of the velocity.



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Lecture



Lecture 15: Ampere's Law

Lecture



Problem Solving

Problem Solving

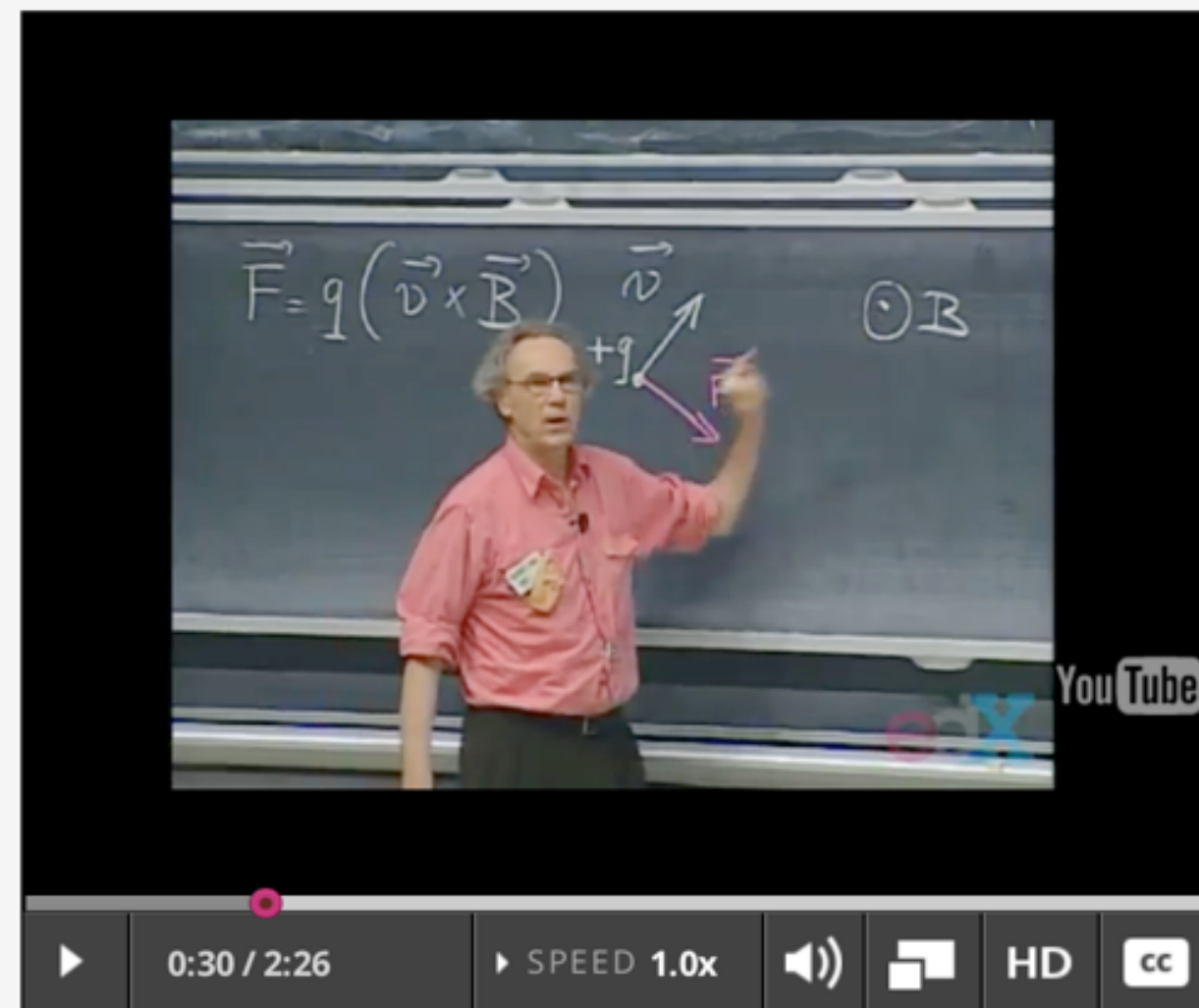
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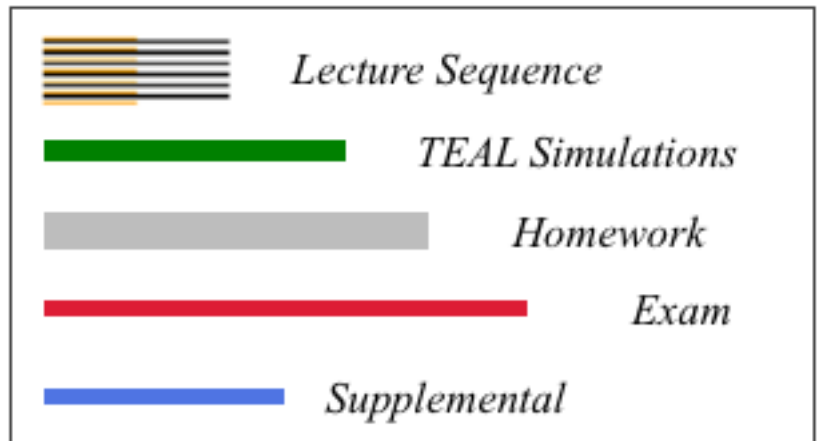
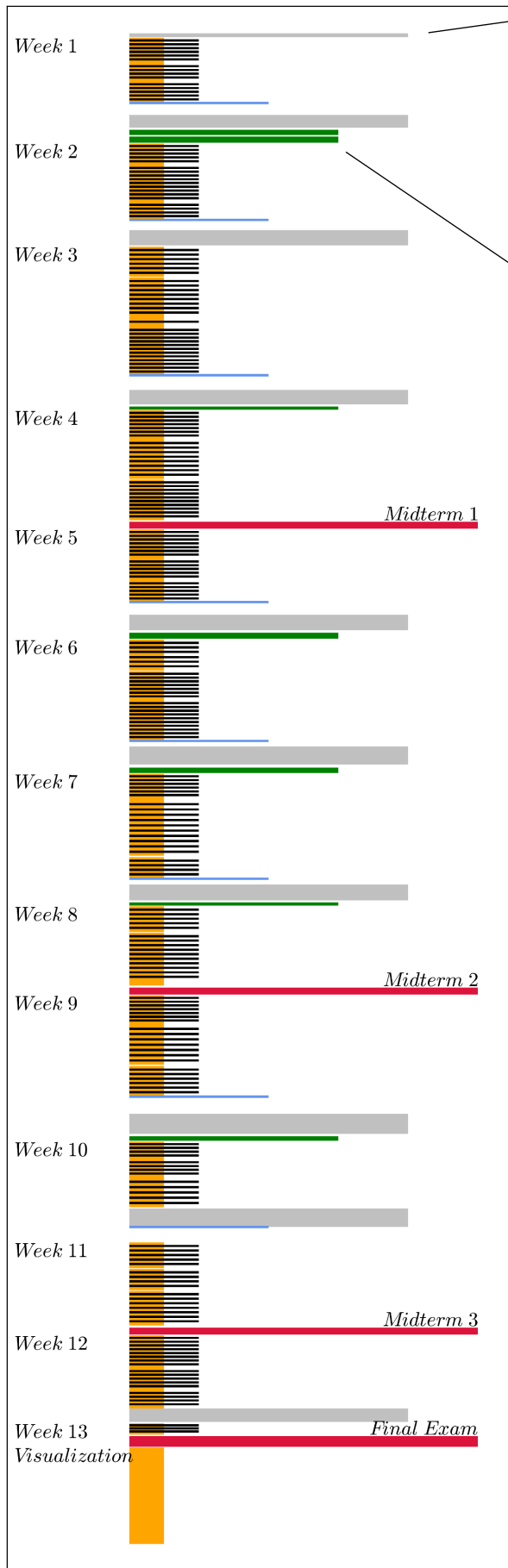
LECTURE 13 VIDEO SEGMENT 2



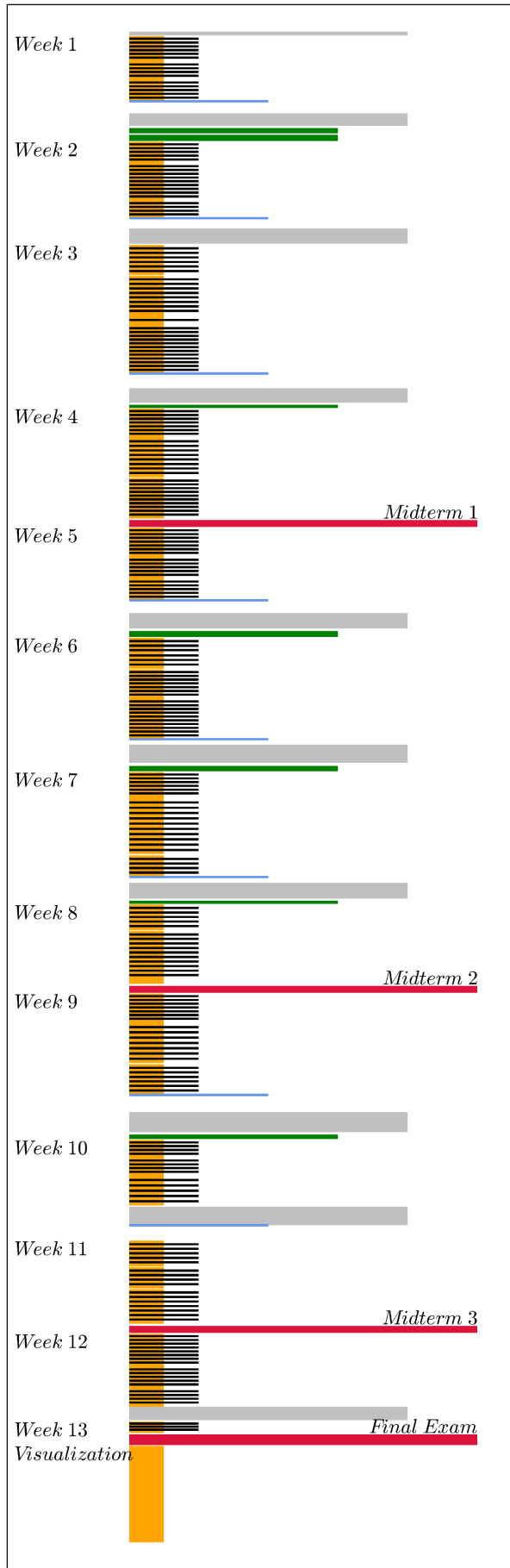
Download video

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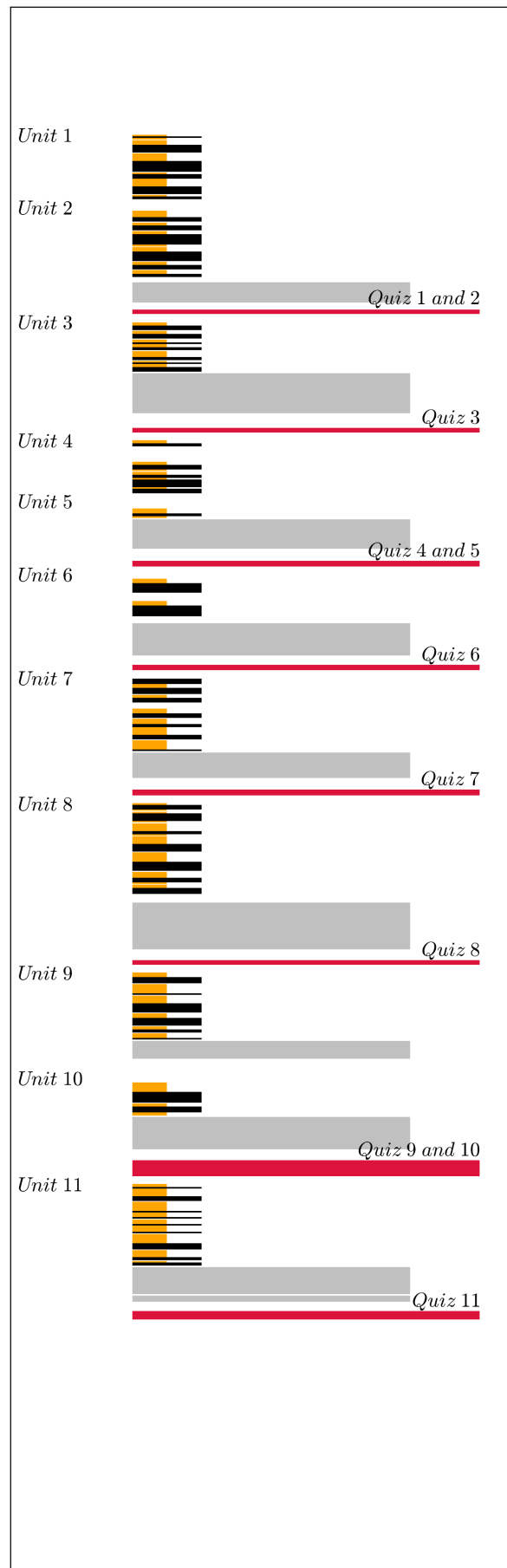
8.02x



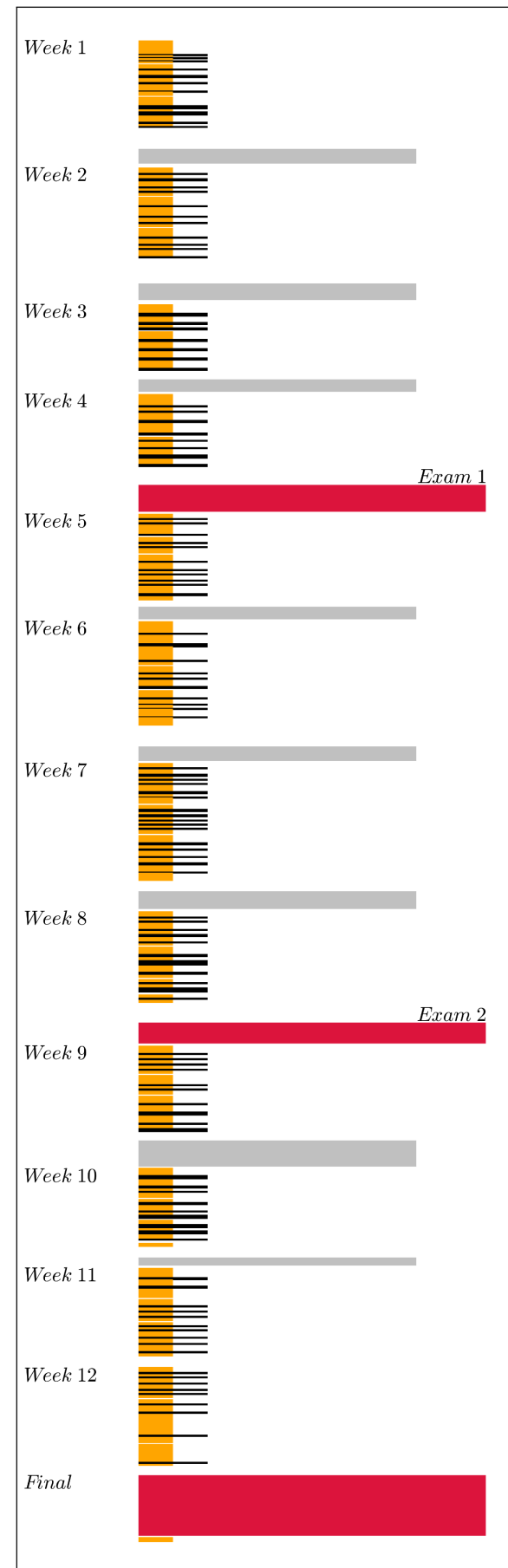
8.02x



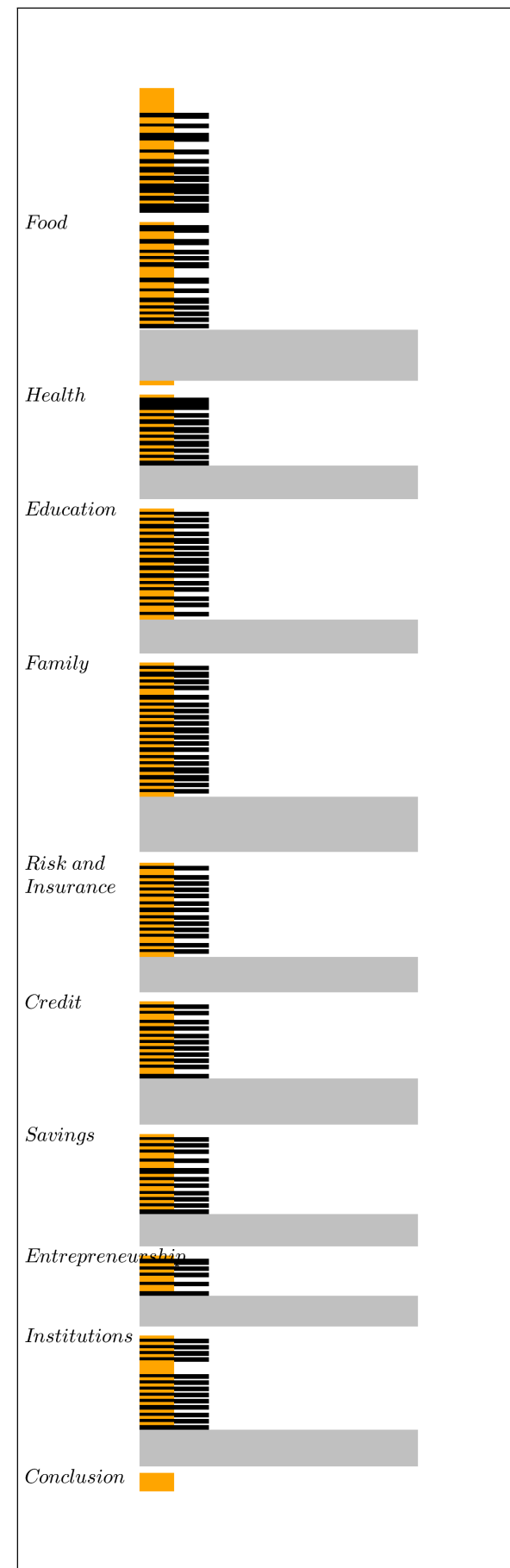
8.MReV



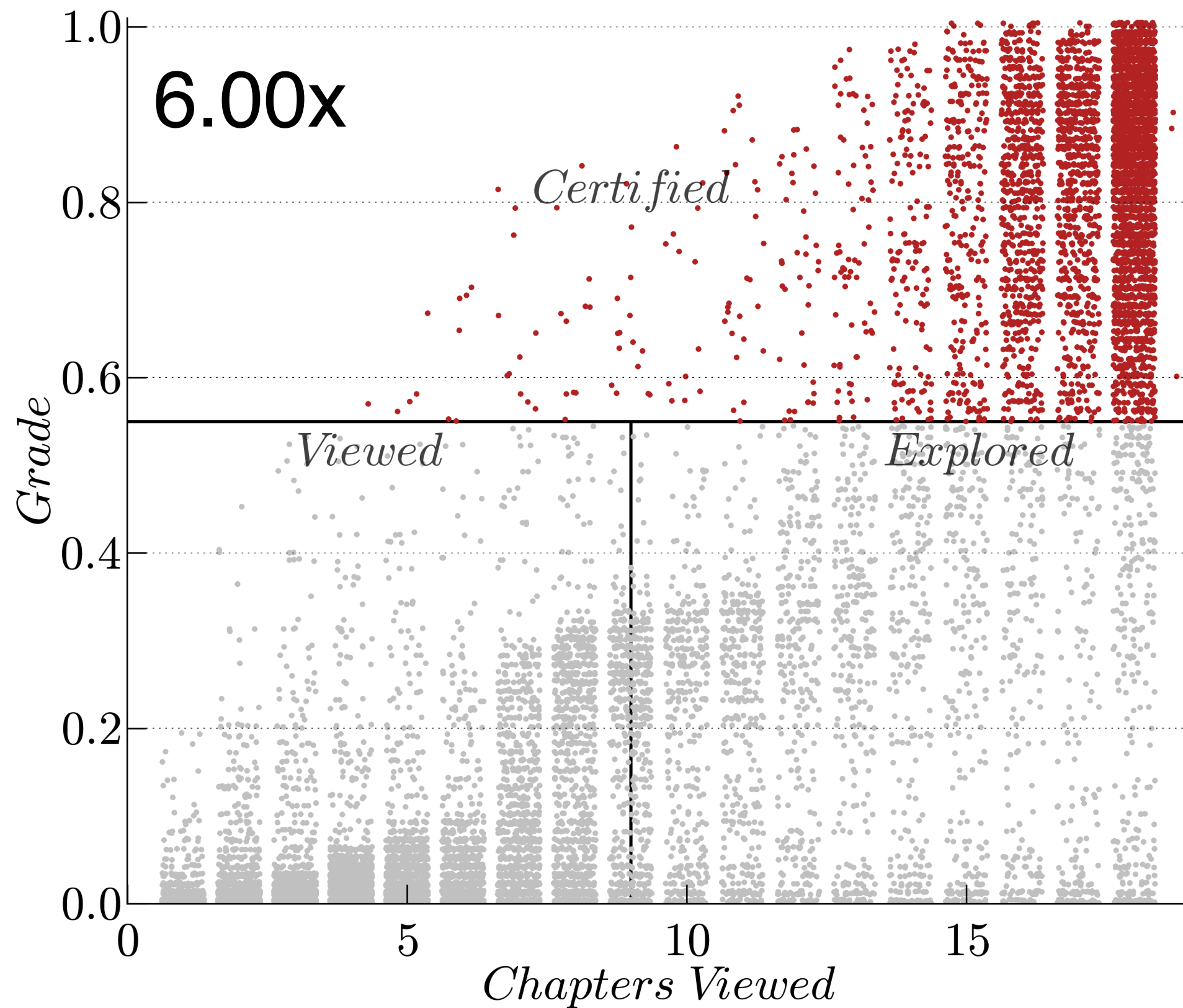
3.091x

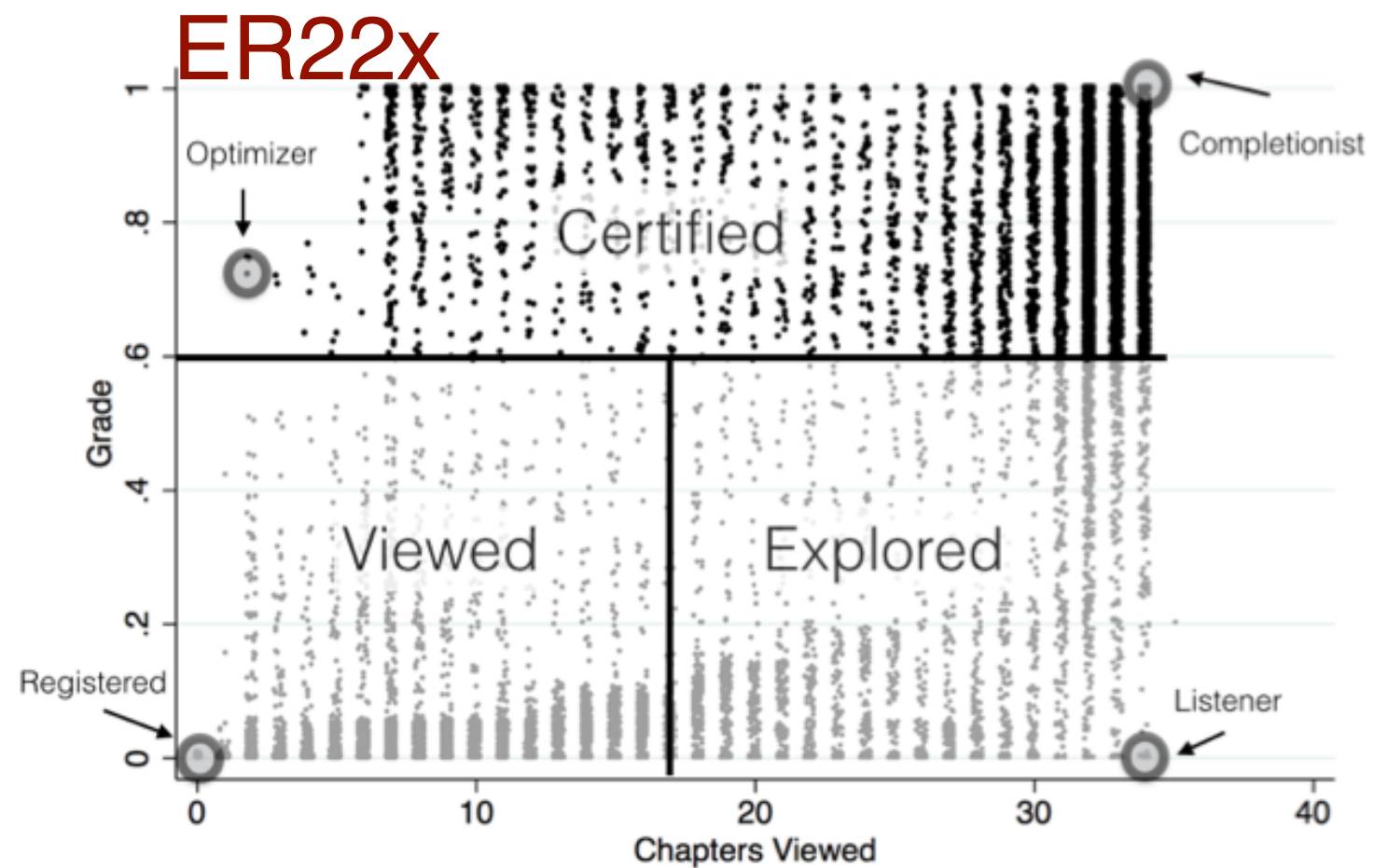
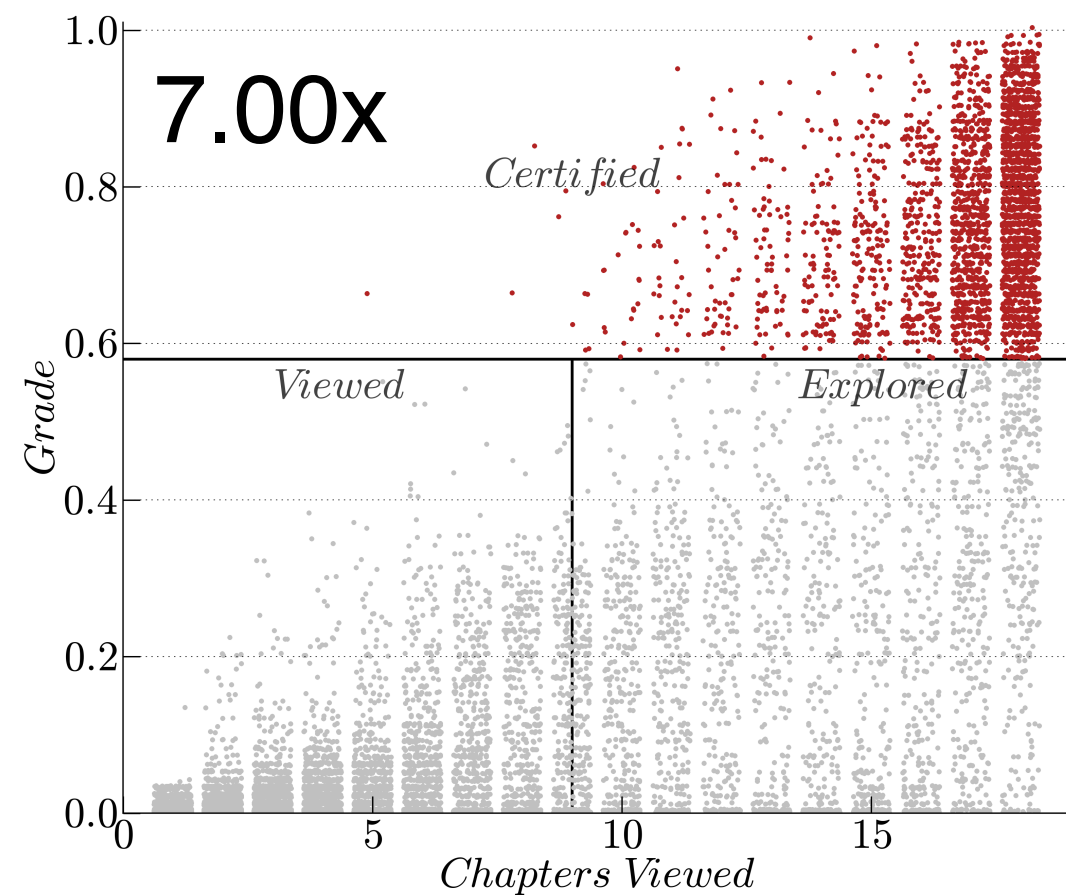
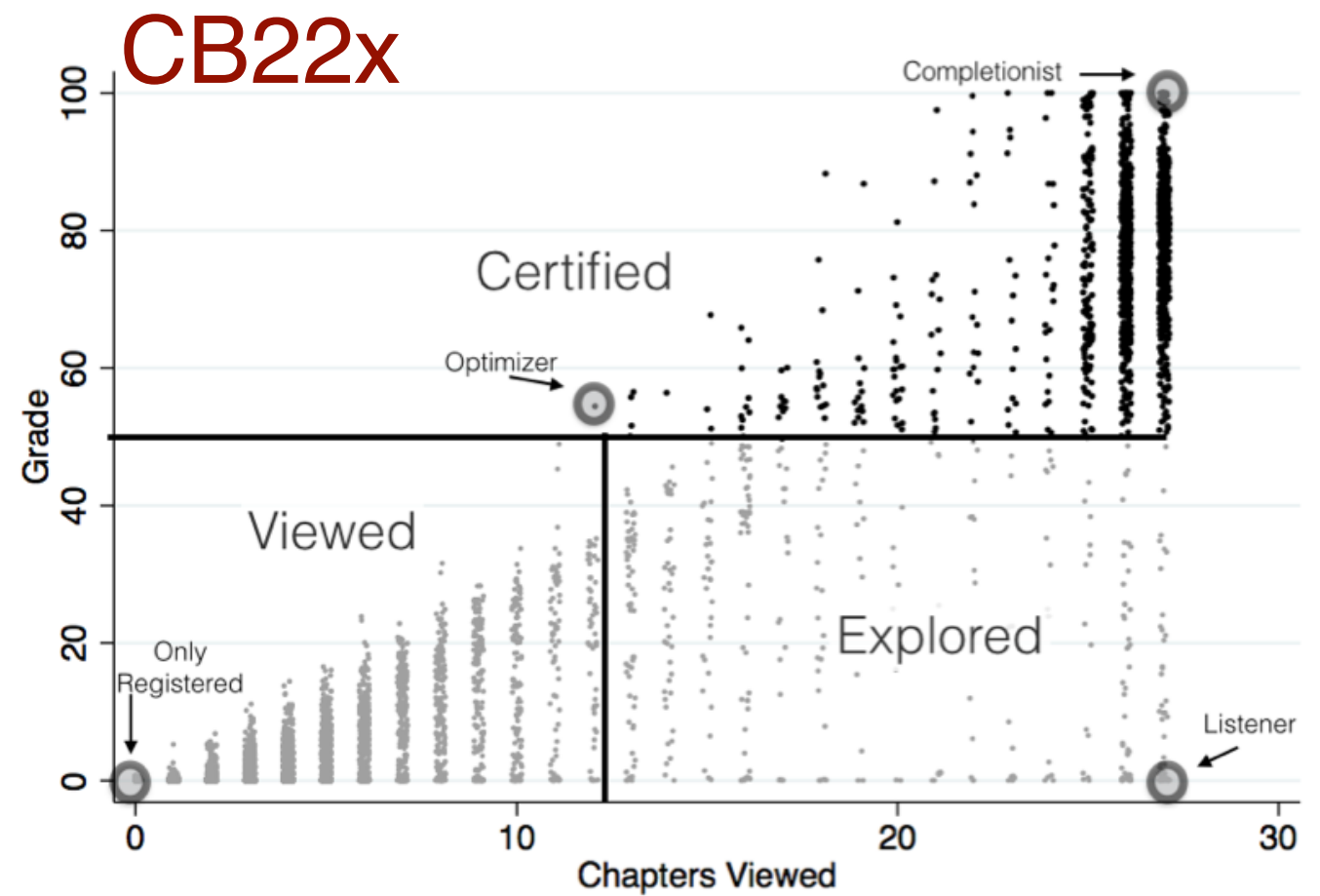
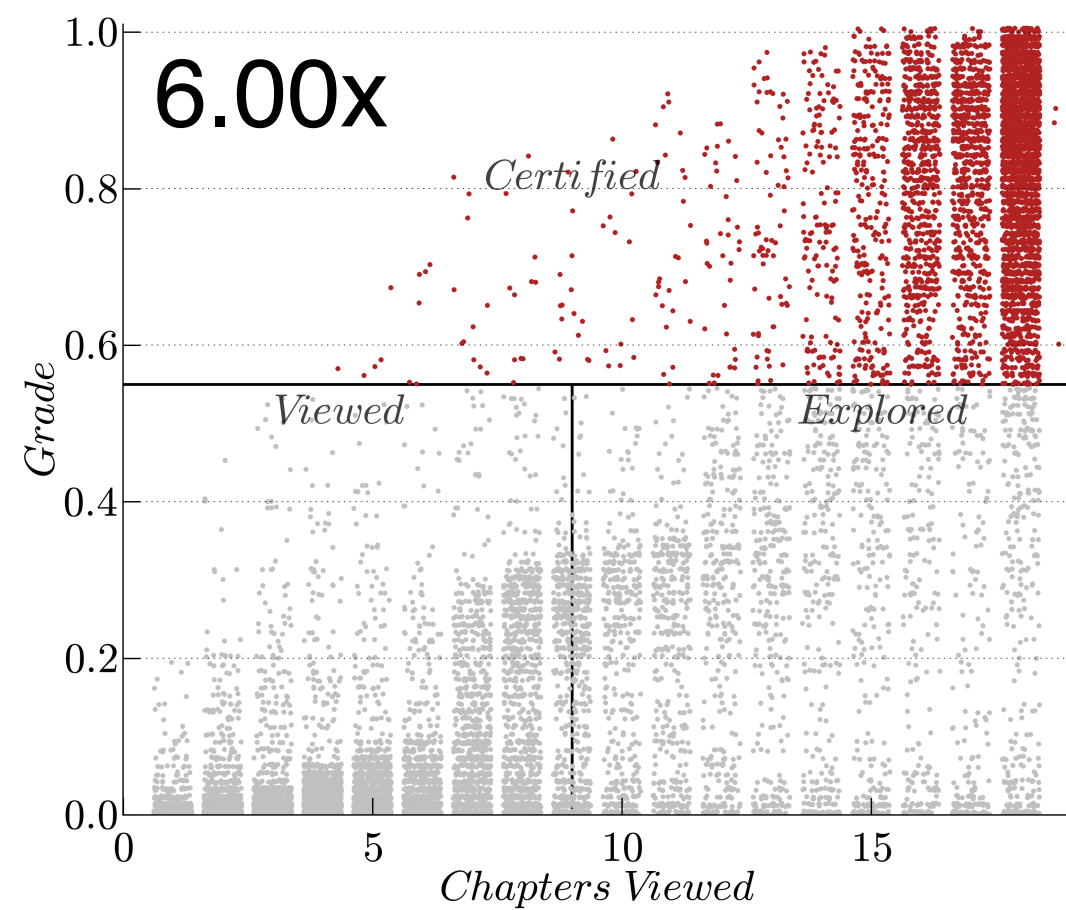


14.73x

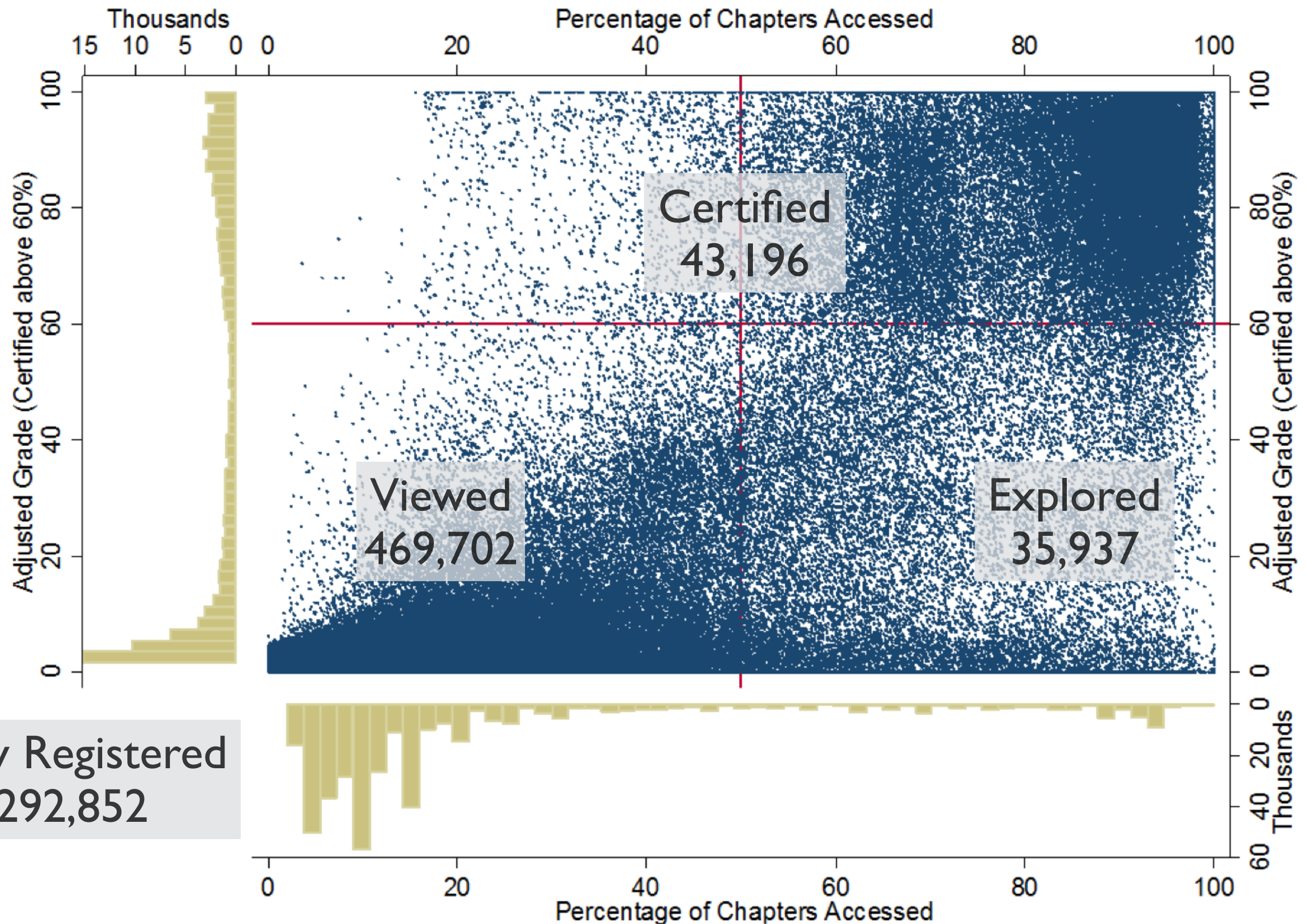


Participant Behavior

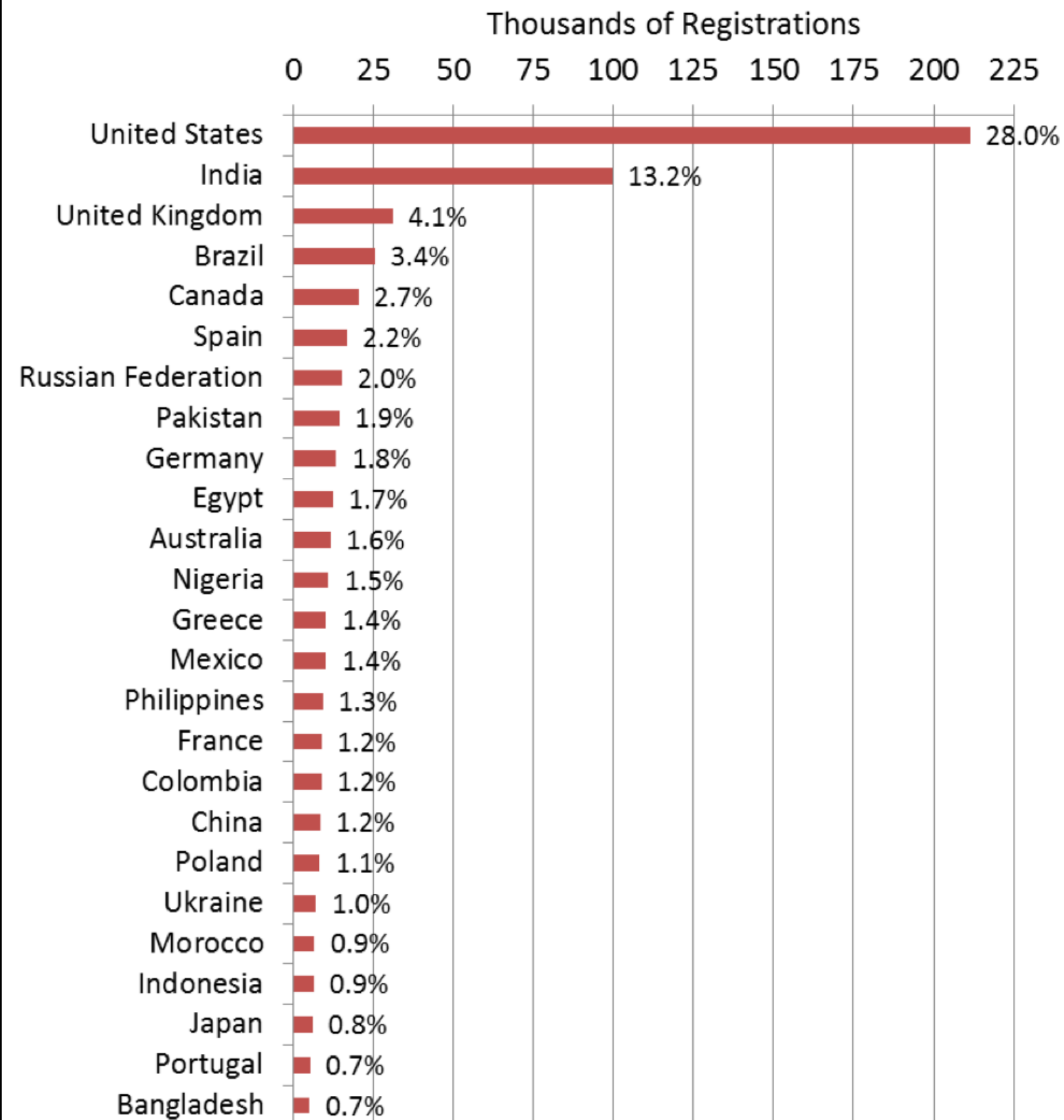




Nearly all possible use cases in MITx and HarvardX

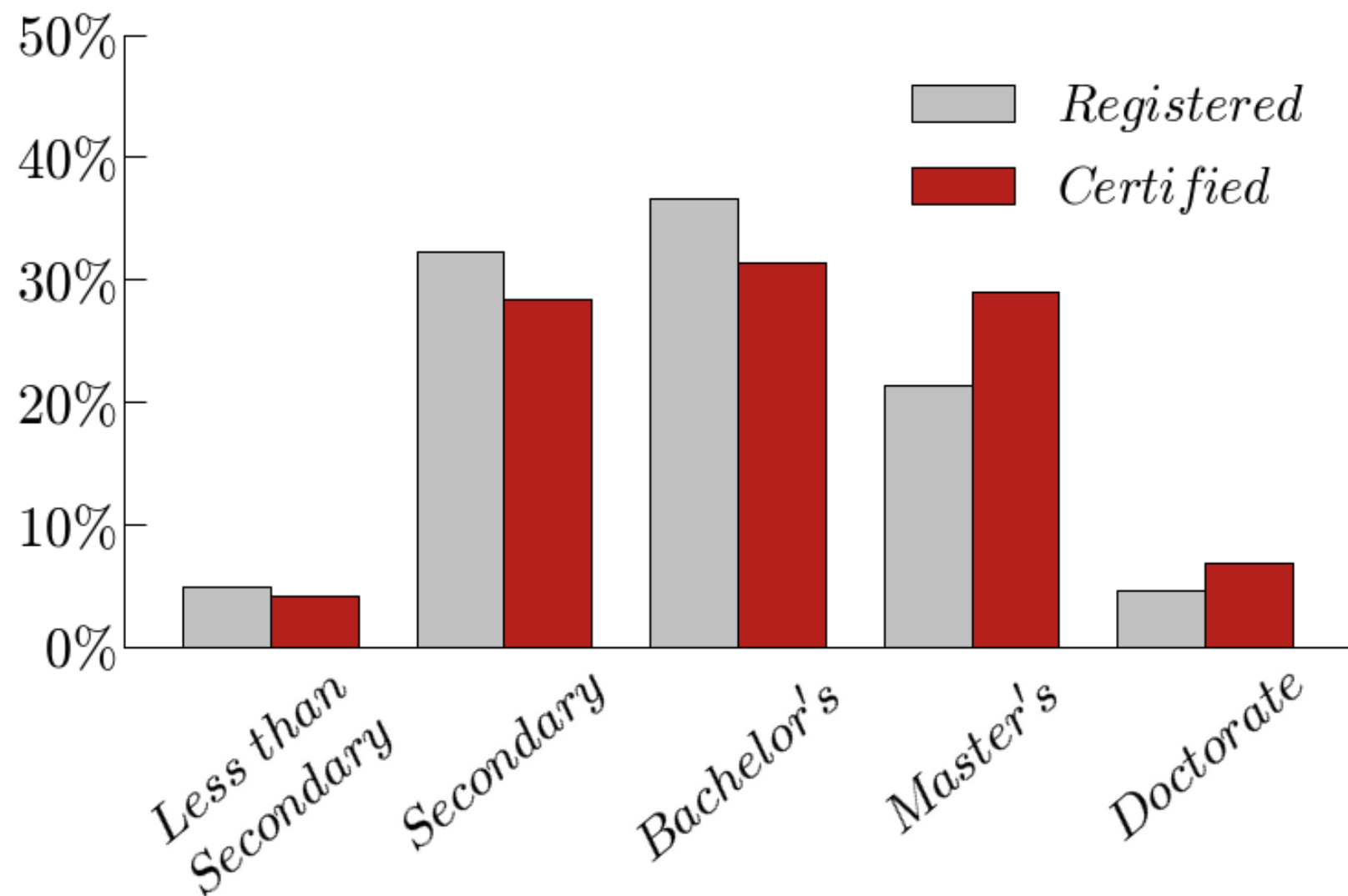


Global Reach



- All registrants from MITx and HarvardX
- Over 70% of registrants are international
- 20 thousand participants from countries on UN's Least Developed Country List

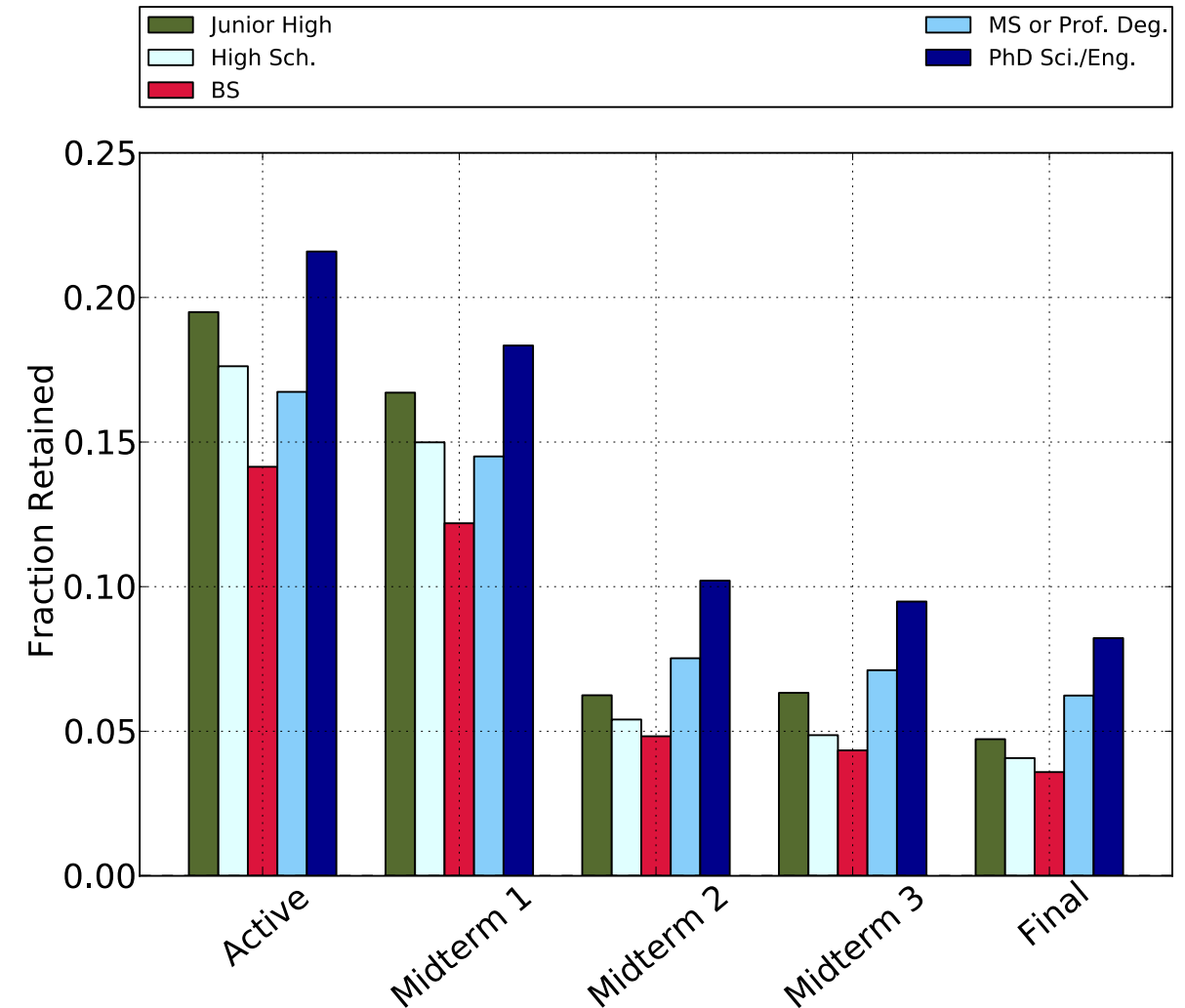
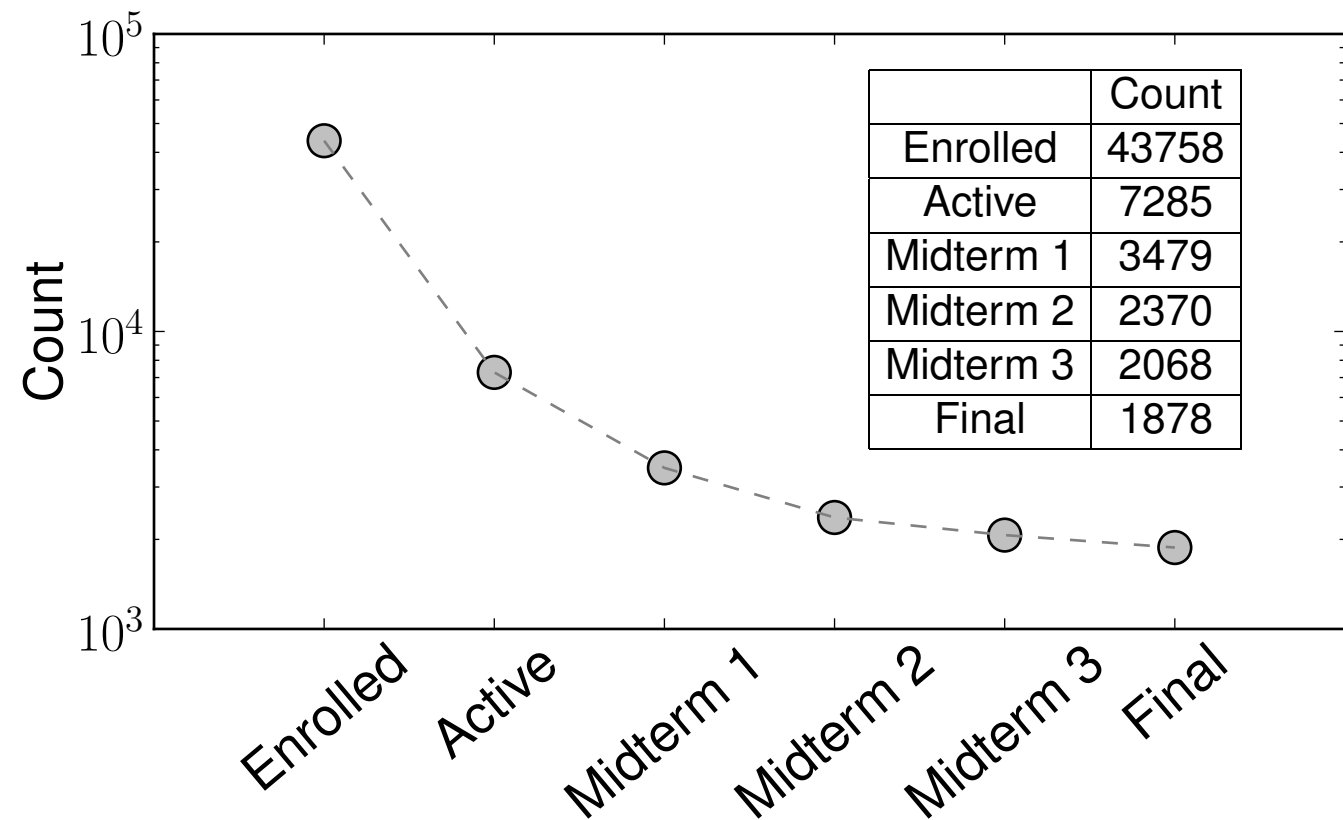
Diverse Backgrounds



- Typical student has a college degree
- **Note**, Small percentages are not small numbers
 - Less than Secondary: 4% ~ 31K

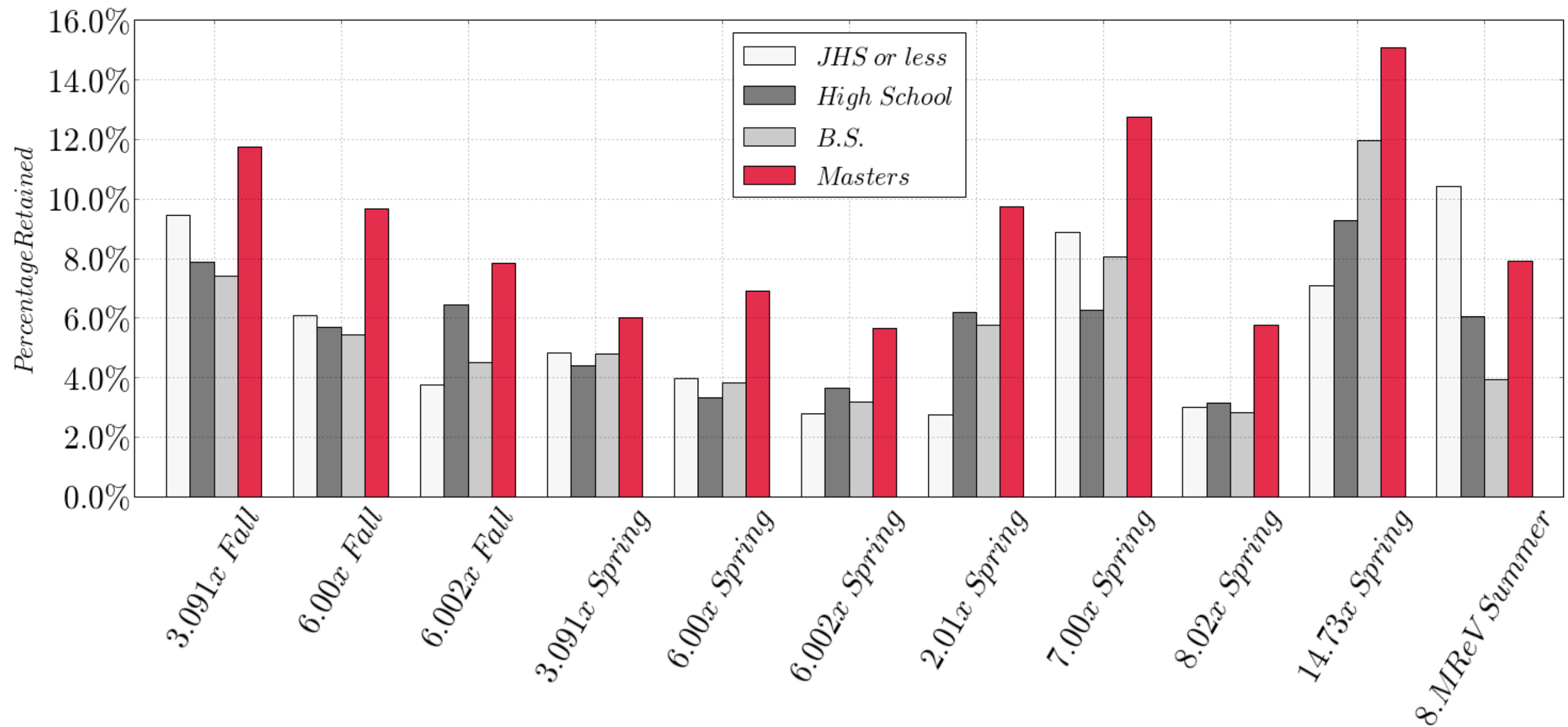
Level of Education

8.02x Case Study



Participation and Performance in 8.02x: the first physics MOOC from edX
Rayyan, Seaton, Belcher, Pritchard, Chuang (In Press - Physics Ed. Research Conference)

How will diverse educational backgrounds impact courses?



Outline

- Introduction
- Key points from MITx and HarvardX course reports
 - Variation in Courses.
 - Registrant Diversity.
 - All MOOC registrants should “not” be labeled as traditional students
- Participant Behavior
- Do demographics predict behavior?

Participant Behavior in Inaugural 6.002x: *Total-Time Spent*

Alternative Title: *What can clickstream data do for you?*

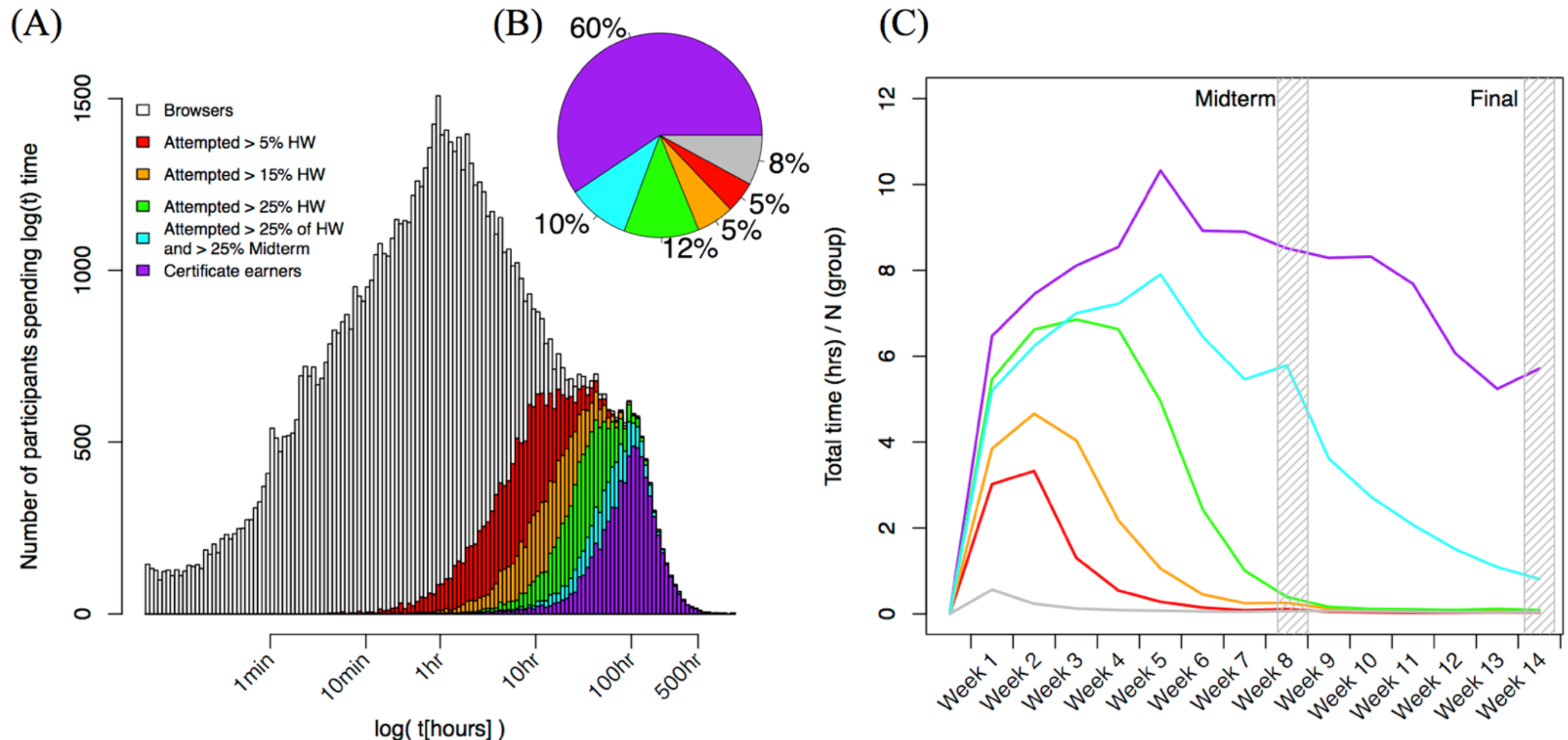
Studying Learning in the Worldwide Classroom: Research into edX's First MOOC

Breslow, Pritchard, DeBoer, Stump, Ho, Seaton (Research & Practice in Assessment - 2013)

Who does what in a Massive Open Online Course?

Seaton, Bergner, Mitros, Chuang, Pritchard (To Appear April 2014 - CACM)

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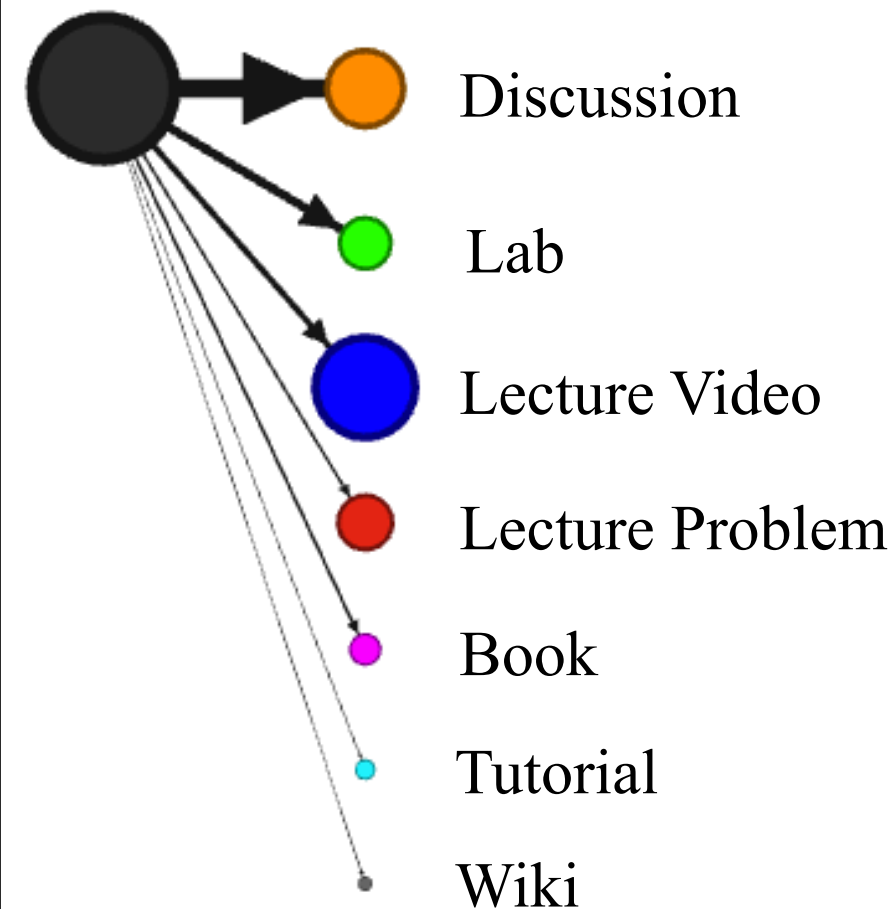
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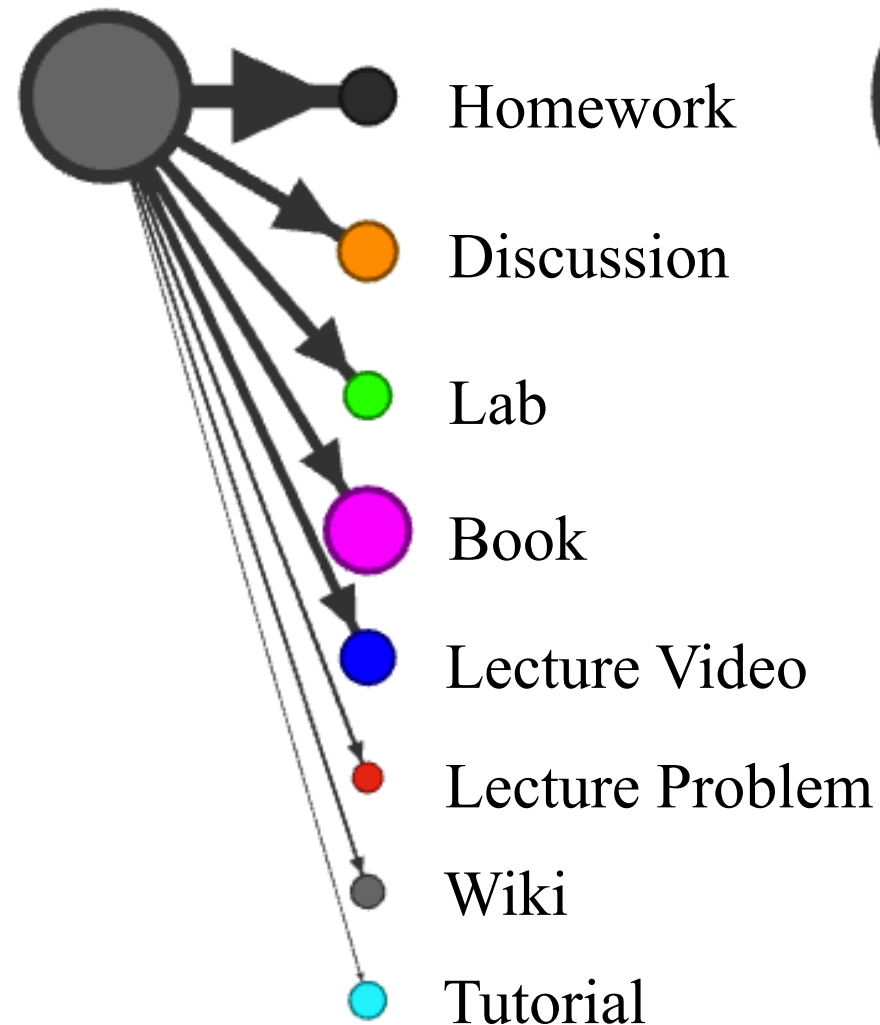
Transitions between course components

... during problem solving sessions

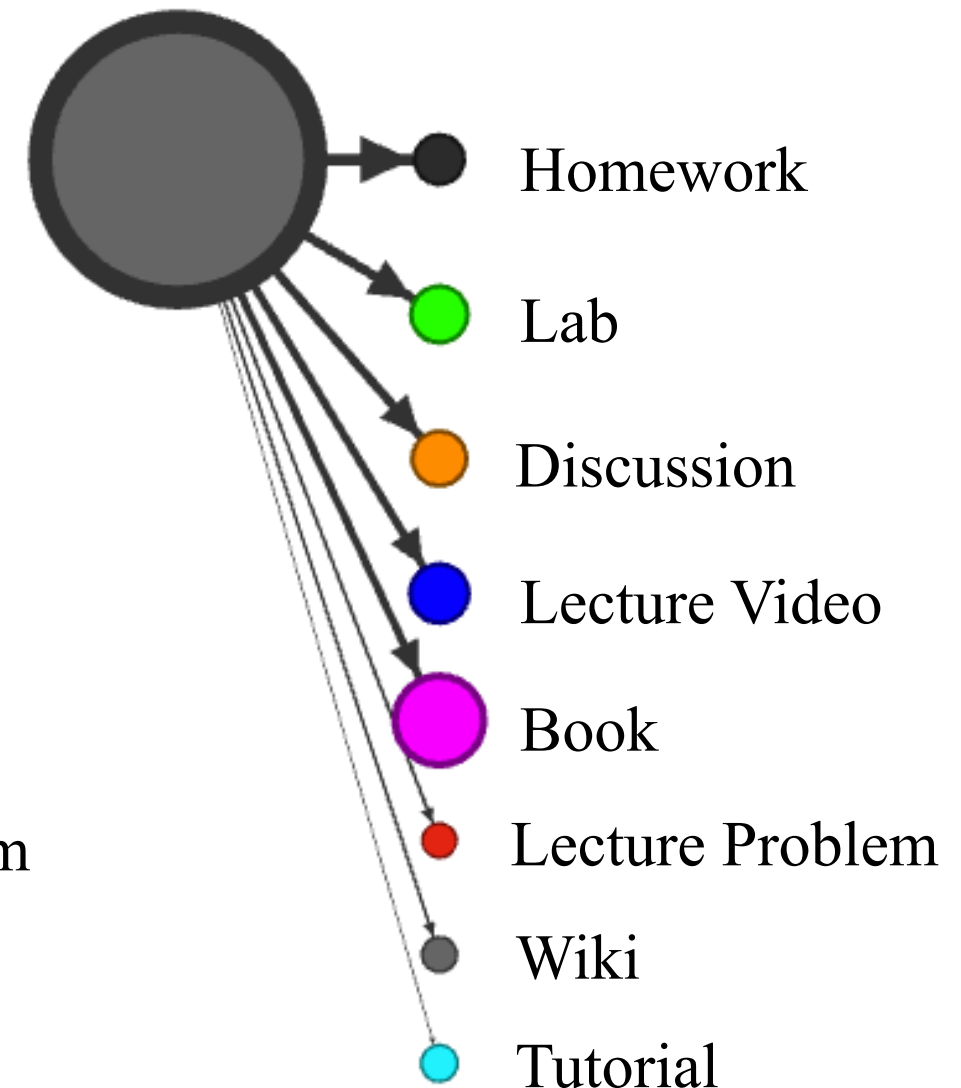
(A) Homework



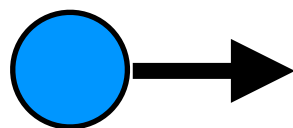
(B) Midterm Exam



(C) Final Exam

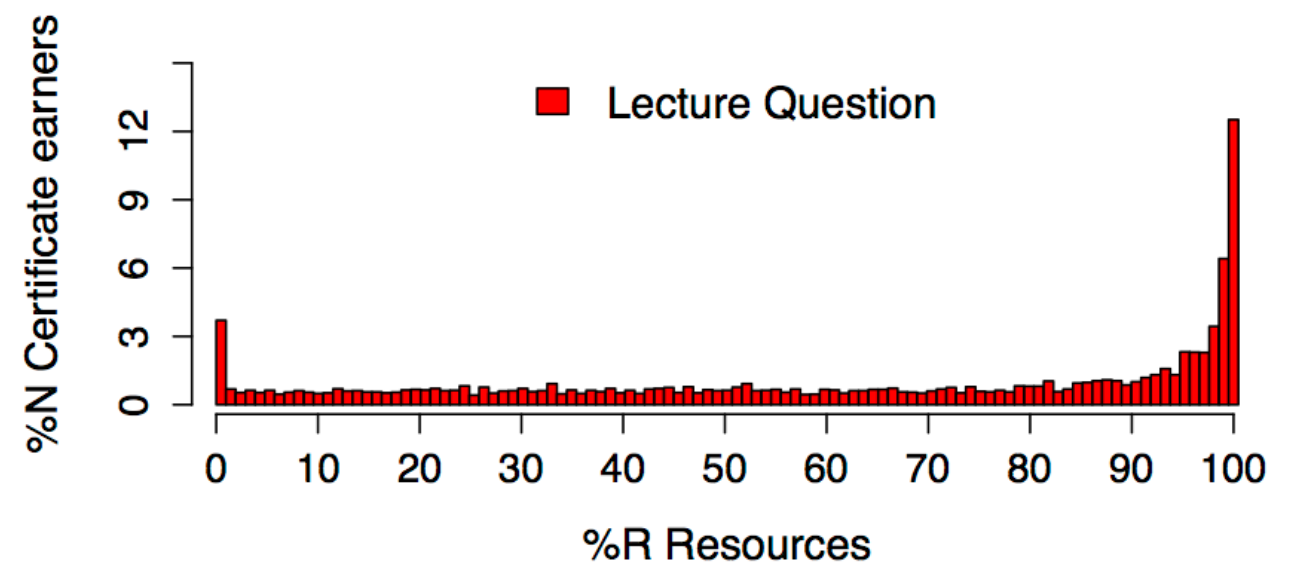
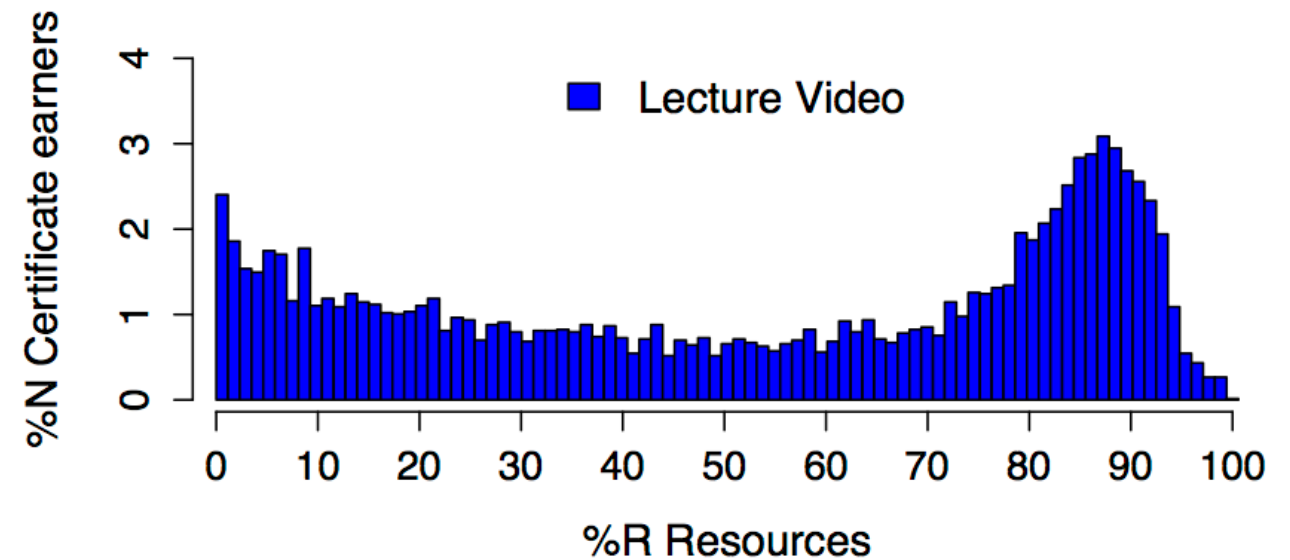
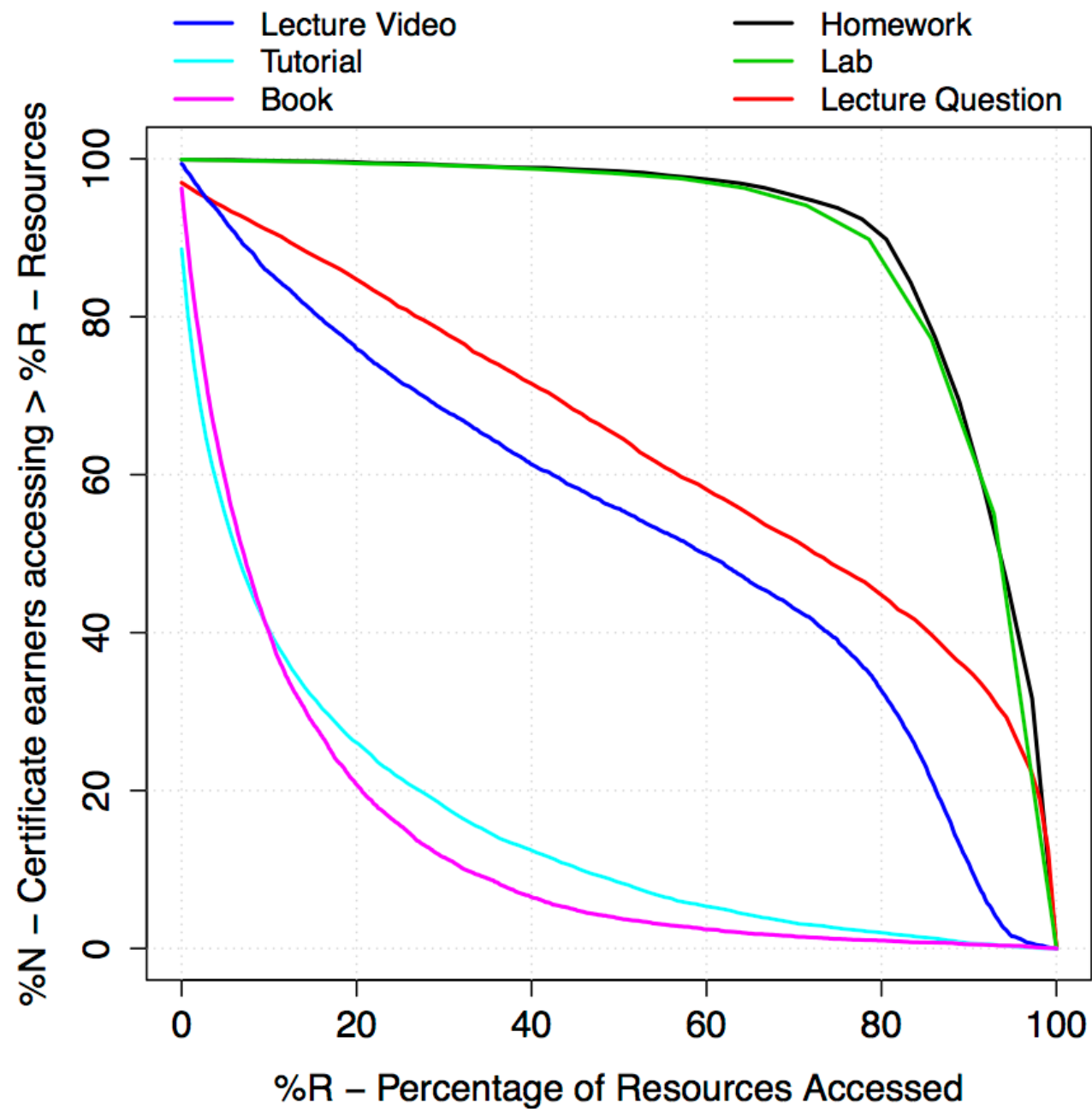


Nodes are resources
(size ~ time spent)



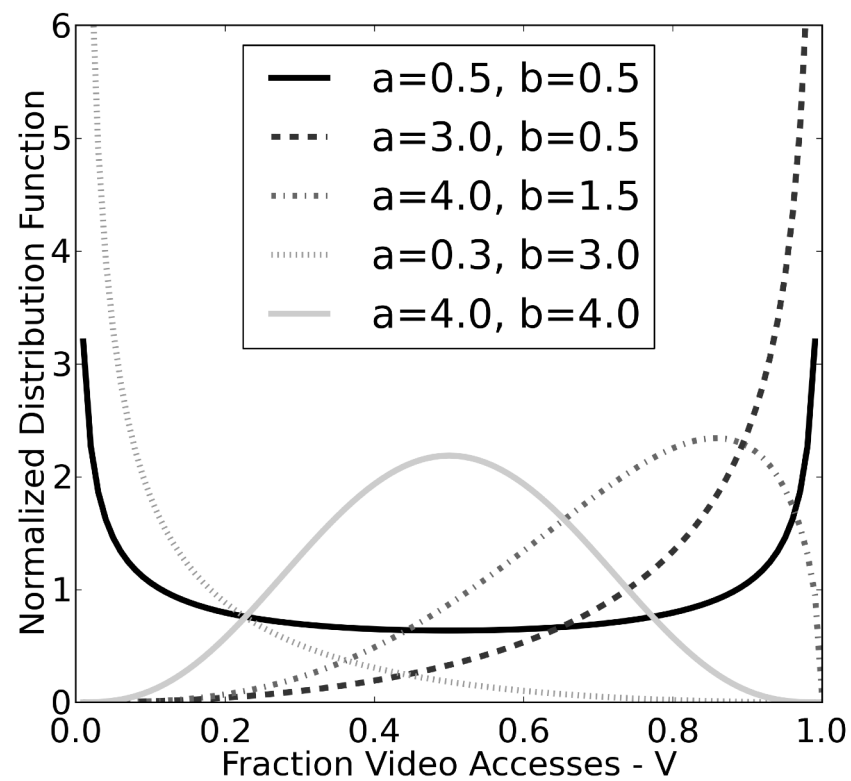
Edges are transitions
(size ~ weight)

Resource Consumption

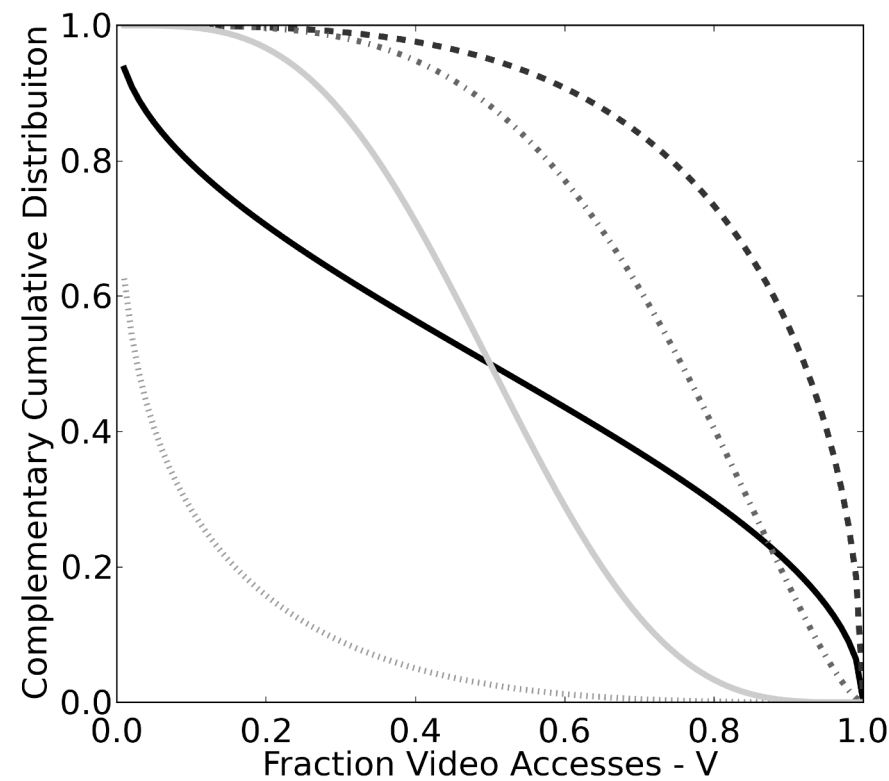


Why complicate histograms?

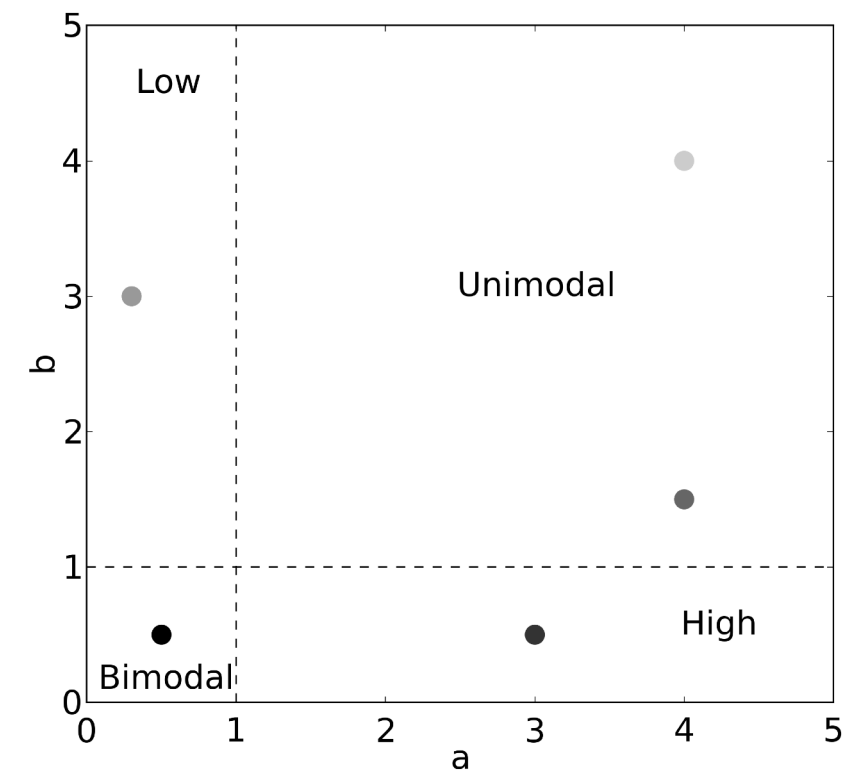
Raw



CCDF

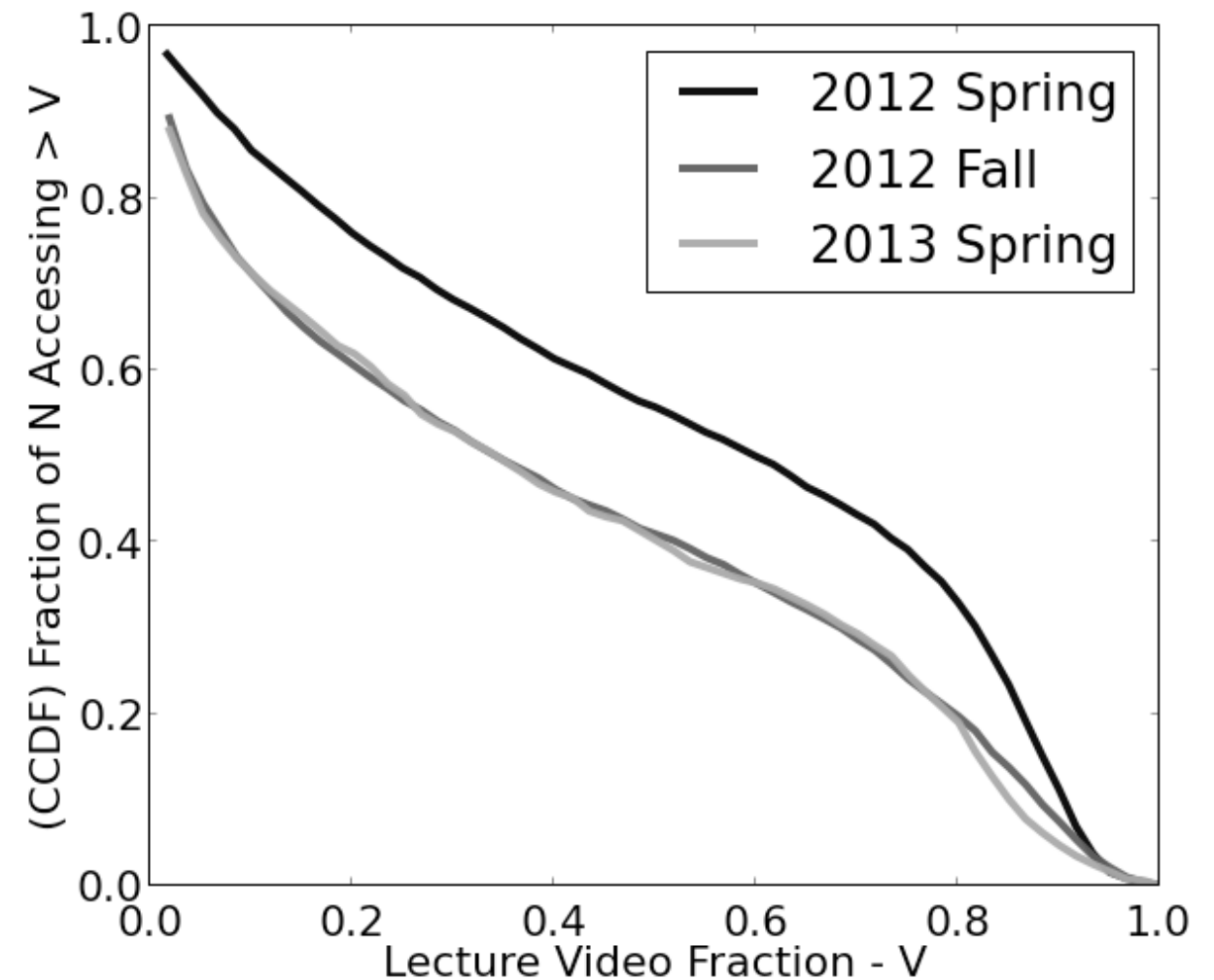
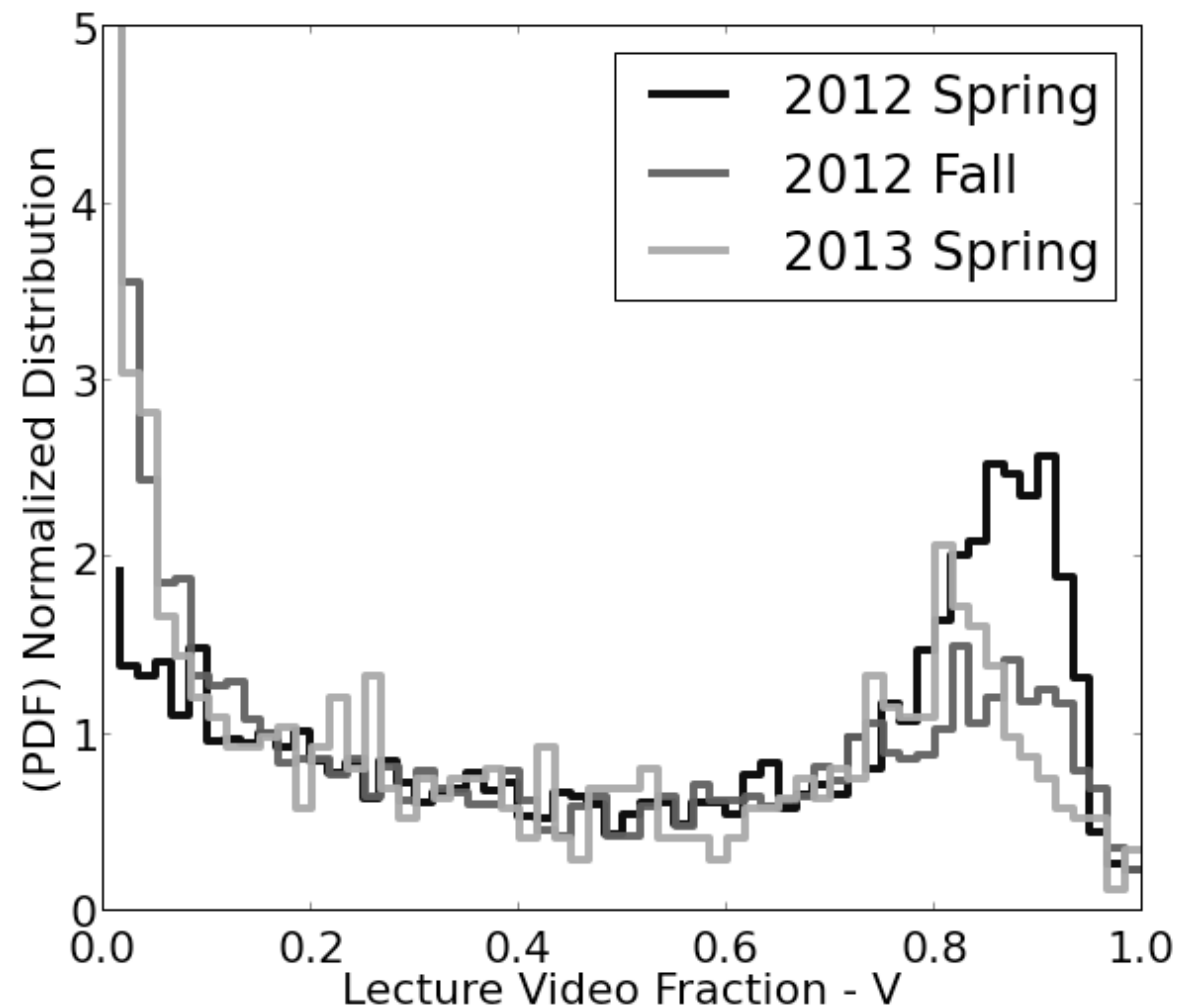


Beta Dist.



Lecture video use in MITx MOOCs

- 6.002x distinctly bimodal
 - Does pattern persist in re-runs?

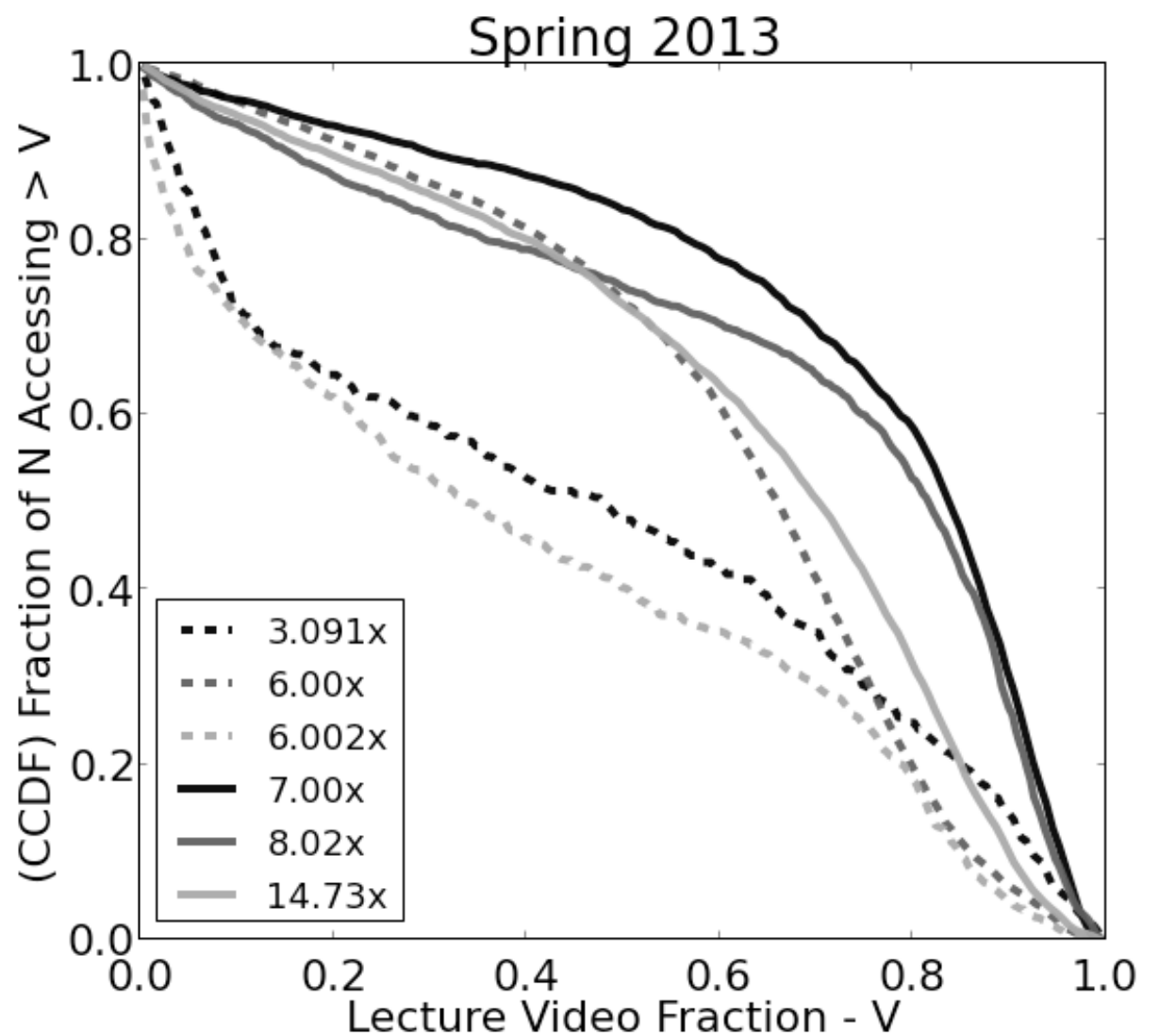
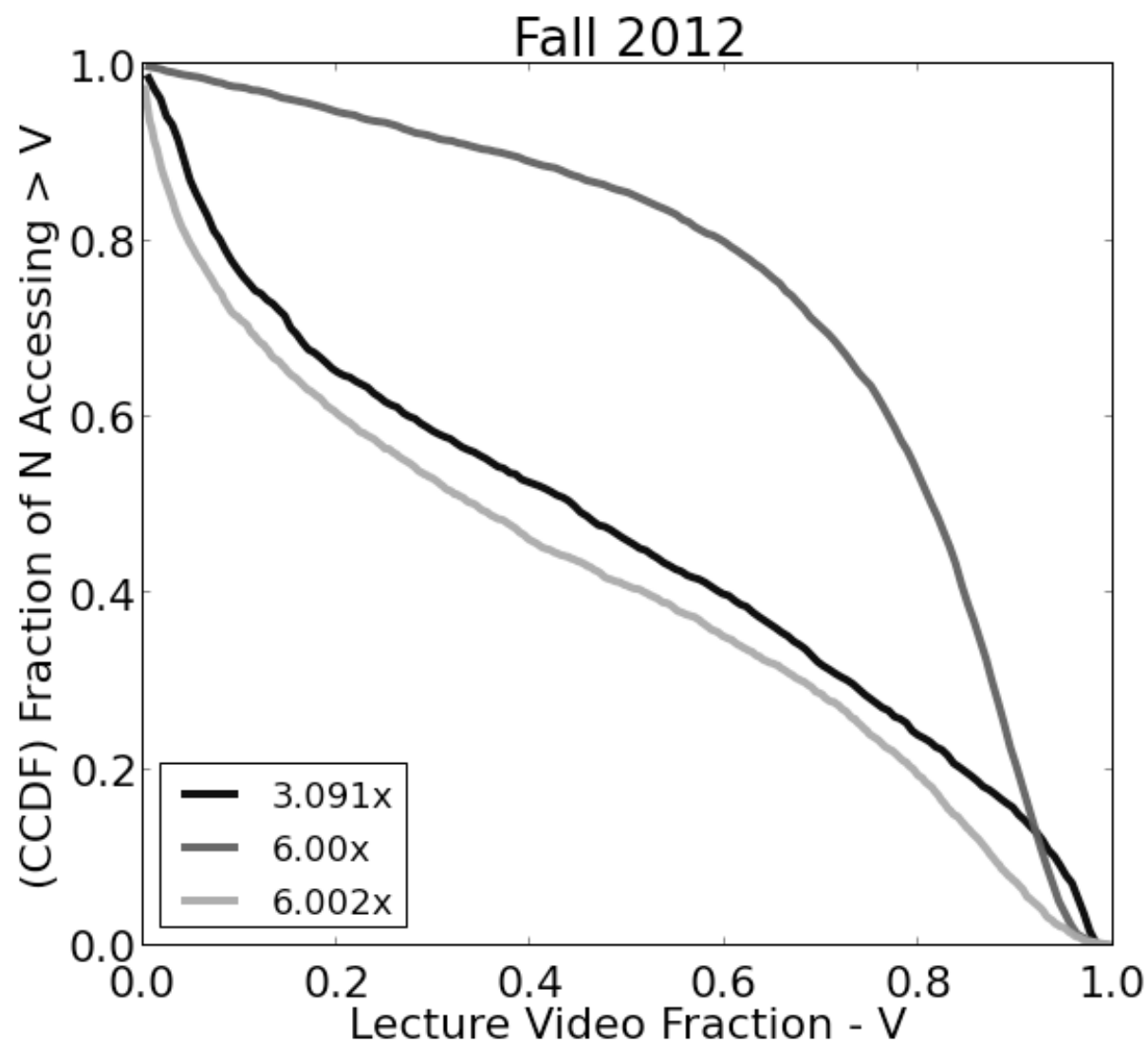


Characterizing video use in the catalogue of MITx MOOCs

Seaton, Nesterko, Reich, Mullaney, Ho, Chuang (Accepted - 2014 European MOOC Summit)

Lecture video use in MITx MOOCs

- 6.002x distinctly bimodal
 - Does pattern persist in re-runs?
 - Does pattern exist in other courses?

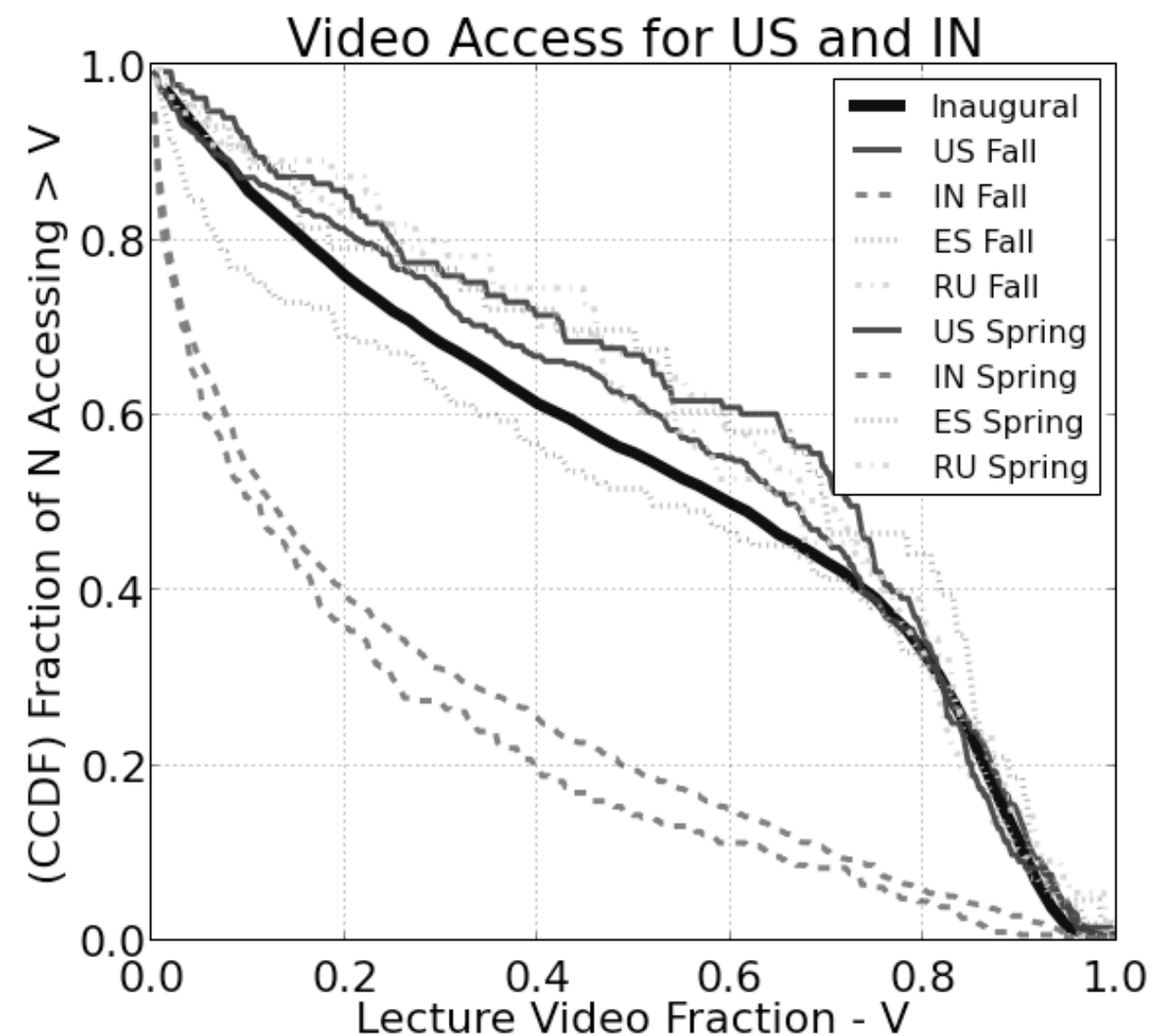
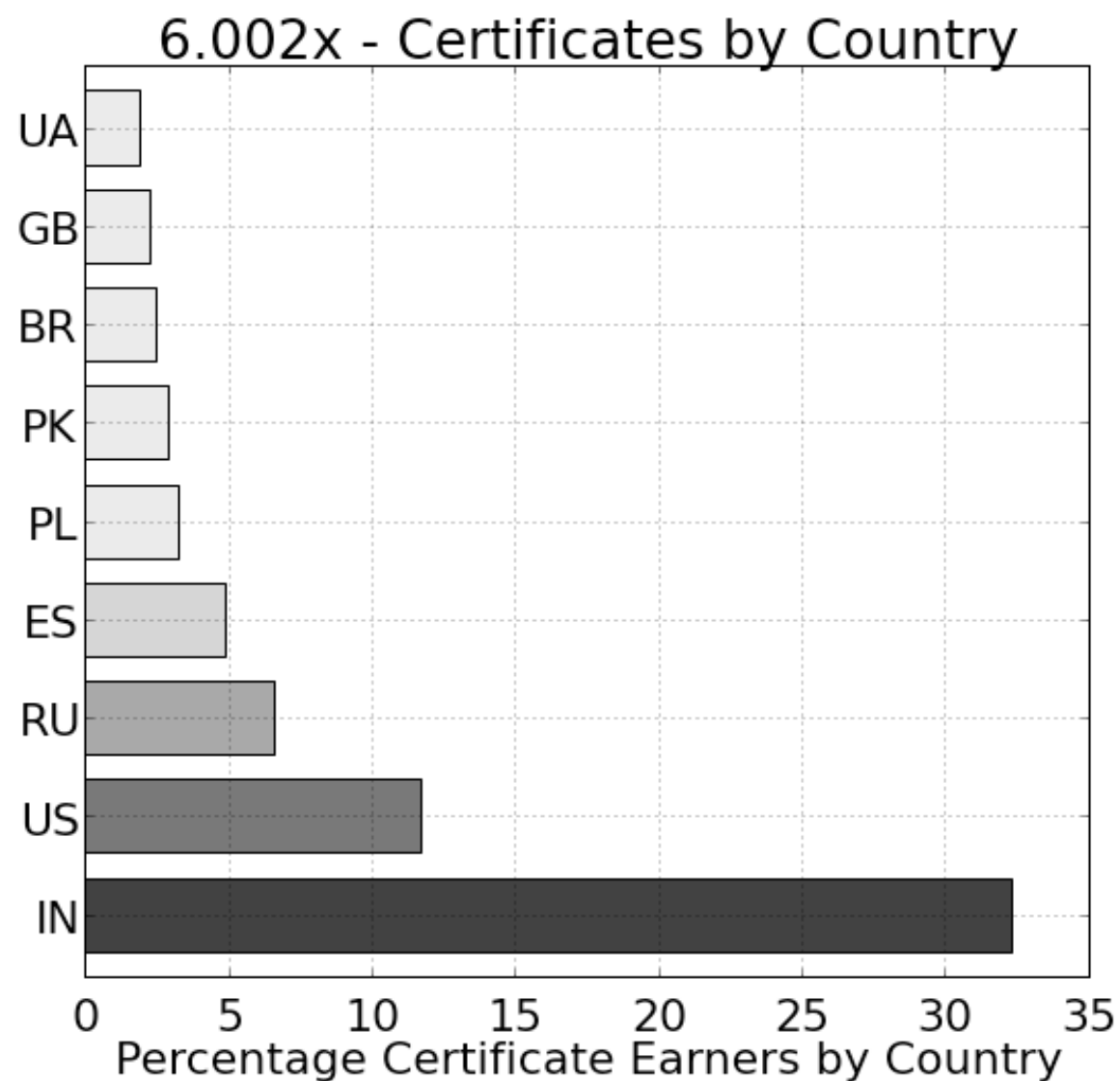


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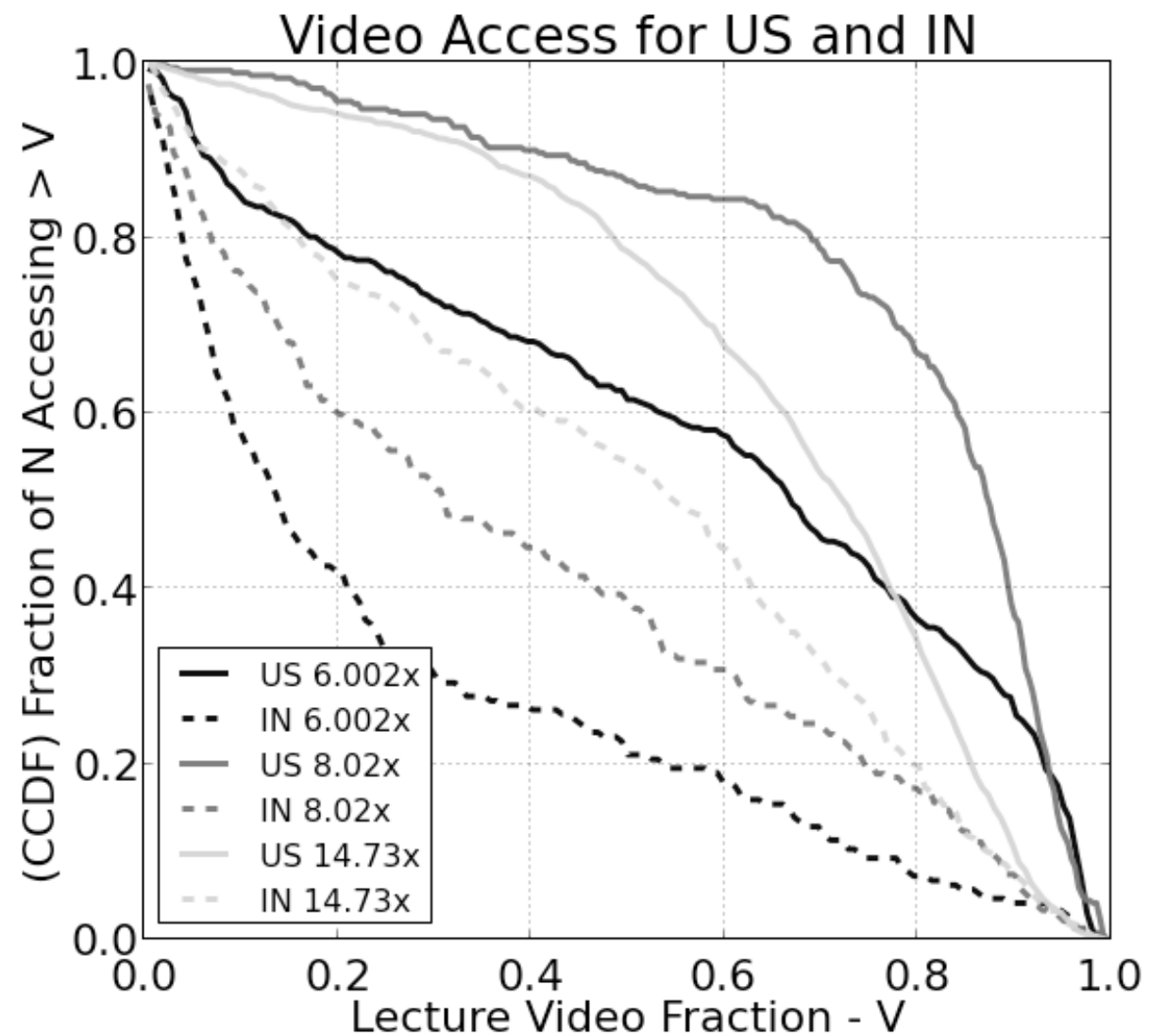
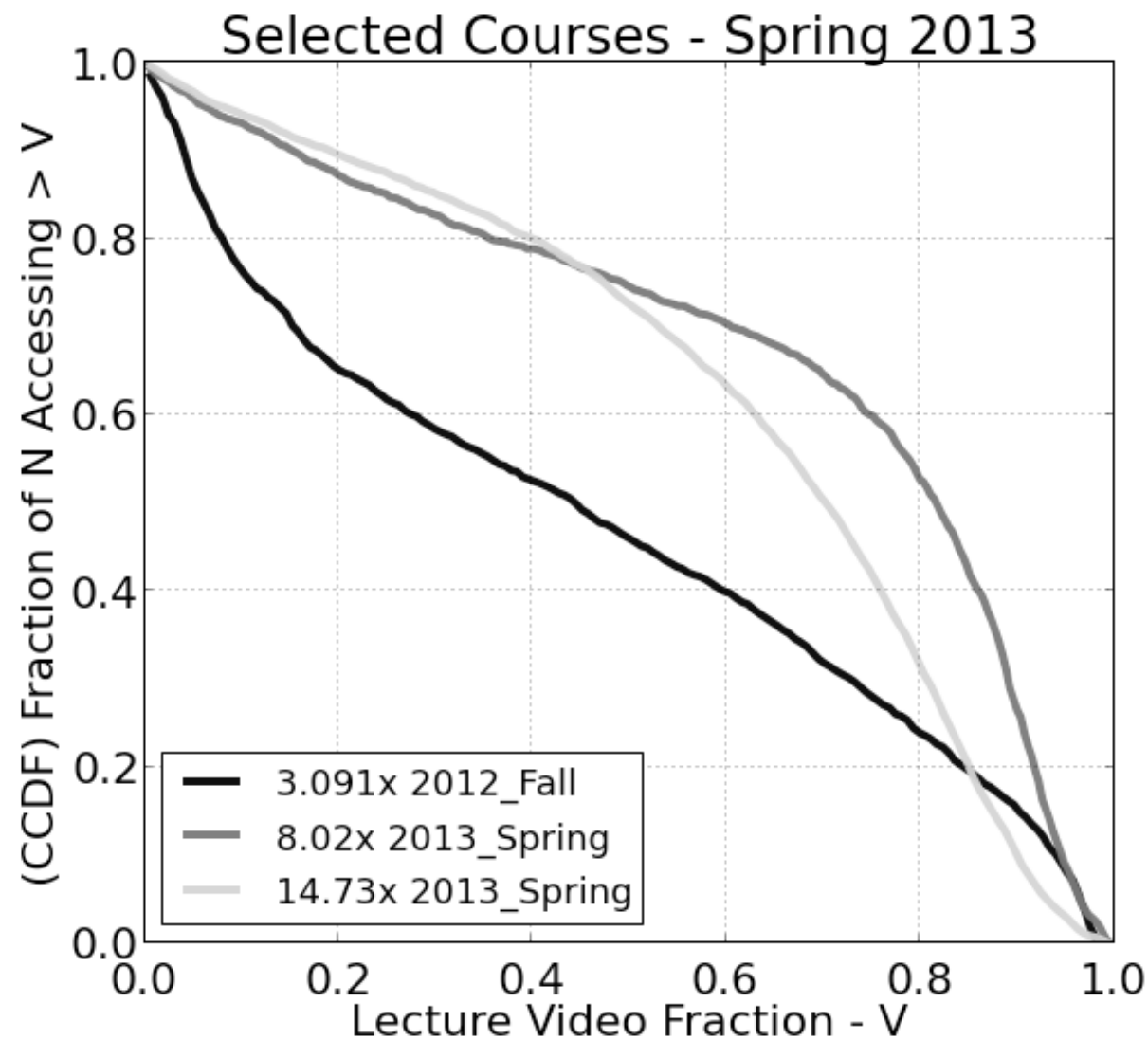
Do demographics explain this behavior?

- Is it a question of access?
 - Country code as a proxy for access.



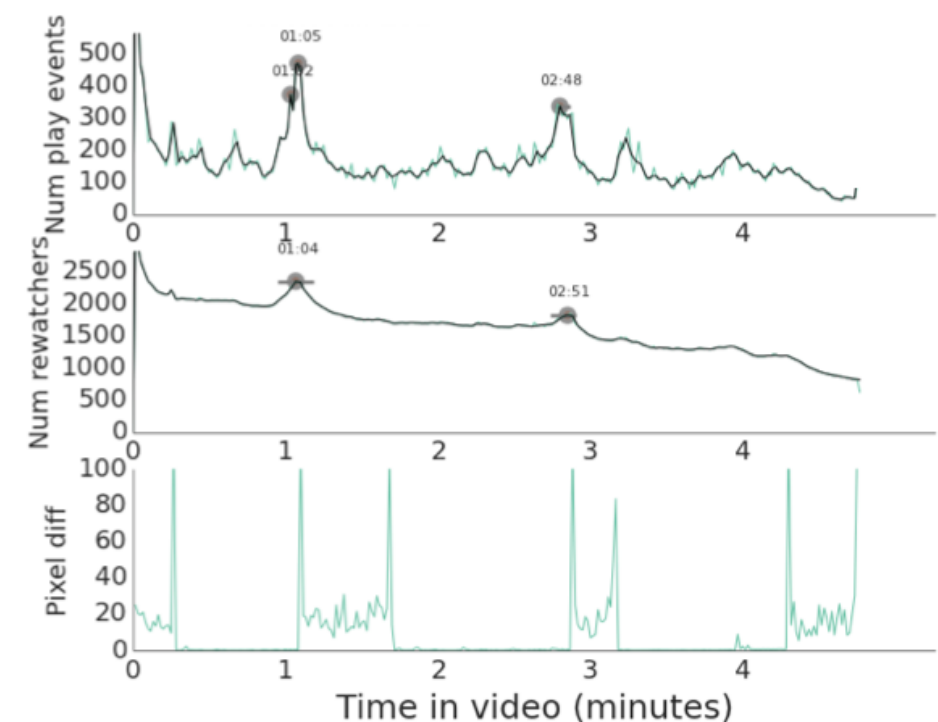
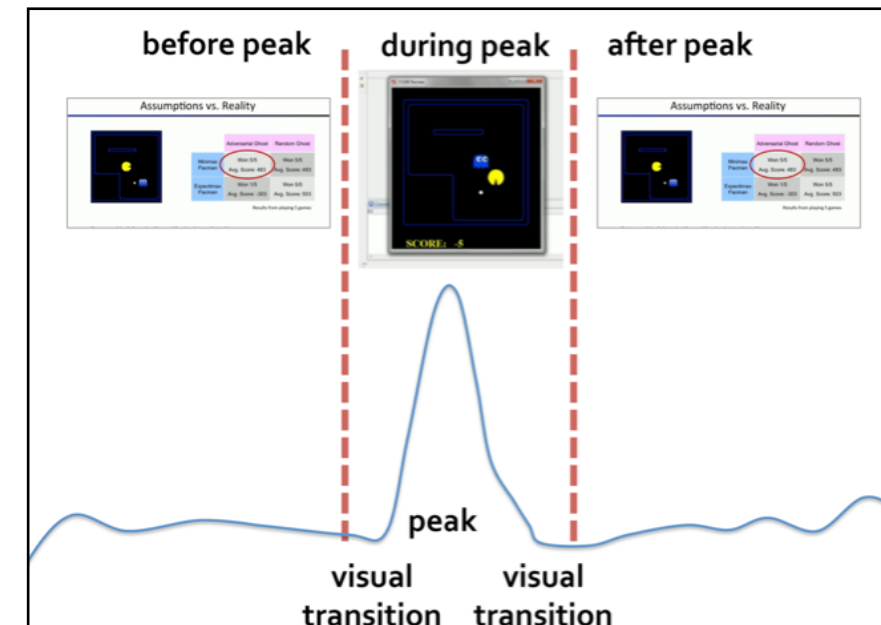
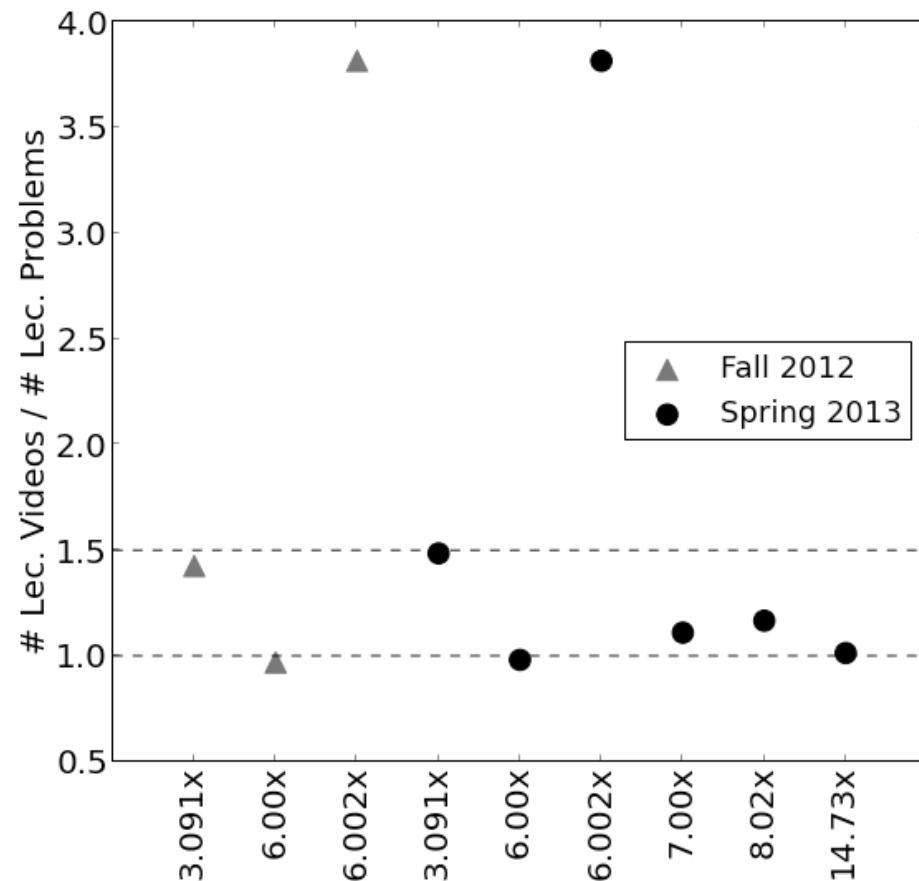
Do demographics predict this behavior?

- Are all courses impacted?
 - US and IN only



What might correlate with this behavior?

- Natural step to analyze course structure.
- As well as “in-video” interactions (content itself).



Understanding in Video Dropouts and Interaction Peaks in Online Videos
Kim, Guo, Seaton, Mitros, Gajos, Miller
(Proceeding of the Learning @ Scale Conference)

Conclusions and future/current efforts

- Much progress in analyzing MITx and HarvardX data sets.
- Hope I imparted the scale and diversity of these courses, and the need to account for diversity in measuring behavior.
- Will expand these analyses in the upcoming year.
- *Thank you for your time!*

Working Papers: <http://odl.mit.edu/mitx-working-papers/>

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