Where's the Remote? Upper-Level Math/Stats Hybrid Course Sharing for the Liberal Arts

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http://web.williams.edu/Mathematics/sjmiller/public_html/

EDUCAUSE Learning Initiative (ELI) Annual Meeting
New Orleans, January 30, 2018

Description

Motivation: Share classes to supplement/keep small liberal arts flavor.

Implementation: Miller: Math 331: Problem Solving: Taught at Williams in Spring '17 with 3 remote at Swarthmore, 2 auditing from Amherst.

Implementation: Hu: Math 347: Bayesian Statistics: Taught at Vassar in Fall '18 with 1 remote at Swarthmore

Joint with: Many colleagues, especially Dr. Elizabeth Evans, the Director of the Liberal Arts Consortium for Online Learning, a partnership of Amherst, Bryn Mawr, Carleton, Davidson, Hamilton, Haverford, Pomona, Swarthmore, Vassar, Washington & Lee and Williams.

Goals

Goals for the talk:

- Discuss administrative issues.
- Discuss mechanics of courses.
- Report on class and next steps.

Administrative Issues

Administrative Issues

Numerous challenges in implementing courses. Below are (some!) non-academic.

- Credit (for students and faculty).
- Department and college buy-in.
- Development time.
- Different calendars.
- Different previous coursework.

Miller - Problem Solving

Course Mechanics

- Met MWF 9-9:50am in Williams, posted lectures by noon.
- Homework submitted in person or emailed to grader.
- One class at Swarthmore, 3 live classes using a Surface and GLOW.
- Class participation key component: for remote students extensive emailing and phone calls.

Webpage: http://web.williams.edu/Mathematics/sjmiller/public_html/331Sp17/

Snapshot of webpage

Math 331: The little Questions: MWF 9-9:50am, Bronfman 103

Professor Steven Miller (sjm1 AT williams.edu), 202 Bronfman Science Center (413-597-3293)

My office hours: TBD and whenever I'm in my office (click here for my schedule). TA Sessions: Mon 7-8 B34, Thurs 7-8:30 Bronfman B34

Useful links:

- additional comments
- articles/videos
- handouts
- homework
- links (contests, books)
- Mathematica programs
- objectives
- syllabus/general
- takeaways (all classes)
- welcome letter

GENERAL INFO: This is a pre-core 300 level course; no advanced classes are assumed, but if you have not taken linear algebra please contact me. Using math competitions such as the Putnam Exam as a springboard, in this class we follow the dictum of the Ross Program and ``think deeply of simple things''. The two main goals of this course are to prepare students for competitive math competitions, and to get a sense of the mathematical landscape encompassing elementary number theory, combinatorics, graph theory, and group theory (among others). While elementary frequently is not synonymous with easy, we will see many beautiful proofs and `a-ha' moments in the course of our investigations. Students will be encouraged to explore these topics at levels compatible with their backgrounds. The textbook for the class is Famous Puzzles of Great Mathematics by Miodrag S Petkovic (published by the AMS: Language: ISBN-10: 0821848143, available http://www.amazon.com/Famous-Puzzles-Mathematicians-Miodrag-Petkovic/dp/0821848143 and http://www.ams.org/bookstore-getitem/item=mbk/63); see the links page for other recommended books (especially Polya's classic text).

OBJECTIVES: The goal is to use interesting problems, puzzles and riddles as springboards to great mathematics, as well as to uphold Williams' honor in several math competitions (Green Chicken, Putnam, VirginiaTech) in future years.

GRADING POLICY: Homework (typically due Fri): 15%, Midterm 30%, Final 30%, Class Participation: 10%, Project Euler: 15%.

Week 13: May 8-12, 2017

- Video: Mon: Dominoes and the Harmonic Series: https://youtu.be/LG-pPUYFhnE
- Video: Wed: Egg Drop Recurrence: https://youtu.be/z9tYmZXDe6Y
- Video: Fri: Harmonic Sums, Teller Problem, Grid Game: https://youtu.be/uYr8polXE-M
- Some takeaways from all classes: https://web.williams.edu/Mathematics/sjmiller/public_html/takeaways/TakeAwaysAllClasses.pdf

Equipment

- iPad mini and swivl system with tripod.

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Figure: Video (go to 4:16): https://youtu.be/TGJtH7K-mXs.

Equipment

- iPad mini and swivl system with tripod.
- Microsoft Surface.

Figure: Surface: pen and touch screen huge asset; programs such as Snagit, Powerpoint, ...

Using technology to help with challenges

Two very different options: straight recording, OIT-production. Function of money and time what can do.

- Calc III: Taylor Series in a Day: Sony Flip Cam: https://www.youtube.com/watch?v=yr01SLw9t4c.
- Calc III: Green's Theorem in a Day: OIT Camera Crew: https://www.youtube.com/watch?v=Iq-Og1GAtOQ.
- Problem Solving: iPad (go to 4:16): https://youtu.be/TGJtH7K-mXs.
- Double plus ungood: OIT: https://www.youtube.com/watch?v=Esa2TYwDmwA.

Technology issues

- OIT recording: higher quality:
  - Processing time.
  - Student workers.
- iPad recording: lower quality:
  - Big issue: blackboard real estate.
  - Simple: just upload to YouTube!

Integrating recorded lectures

What is the purpose of recorded lectures?

- More material (both at home and in class).
- Aids absent students / students who want to review.
- Use material as review / supplement in other classes.
- Easier to travel.
- Obviously essential for remote students!

Implementation issues

- Will students watch it?
- What will they get from it?
- How effective is it?
- Difference b/w upper level and lower level courses.
- Strength liberal arts colleges knowing each other, lose greatly online.
- Technology failures (recording, wireless, uploading).

Remote Student: Post-core Complex Analysis

My overall experience taking a class online was very positive. This was an opportunity to take a class that I would have otherwise not have been able to take (except as an independent study). Without the structure, a fixed syllabus, and helpful lectures, I wouldn't have covered as much material in an independent study. Once we overcame the technical hurdles and were able to have videos for all lectures, I benefitted tremendously from the lectures. Despite watching with headphones in a quiet section of a library, I found it more challenging to focus on watching the videos than focus on a professor in a physical classroom. I got distracted more often than I would in a physical classroom and would have to watch some videos more than once. Further, I didn't have the option of clarifying things in the moment (with another student or the professor) and felt more compelled to figure things out myself before emailing a fellow student or the professor. While this meant that I had to work harder on watching videos multiple times or re-reading sections of the textbook, I would say that the overall experience was more challenging, but not less meaningful, than a course in a physical classroom.

Local Student: Multivariable Calculus

The partial flipping was a successful, interesting twist to class (though I think it worked in large part b/c of Prof Miller's way of teaching). Your website with many different kinds of practice problems, lecture notes, and additional comments with various links played an influential role to my performance in this class. I watched all the videos you sent via email and on GLOW. I watched some of the optional videos on the webpage when I had time or something I wanted to learn more about. Most of the time, however, I watched the mandatory videos after class b/c I viewed the online videos as good reviews of the lecture for that day rather than as previews since I prefer learning new material in person. Also, I watched all of the lecture videos for that class day when I got back to my room and took more notes for things I missed or wanted to emphasize b/c I found them important. You don't know how helpful these recordings were since we cover so much material in such limited time. As a student, I really appreciated this partial flipping system and the available online resources – it really worked.

YouTube and the World: Broader Impact

- Often don't know who watches, though some contact.
- Broader impact: posting general lectures, research talks, conferences.
- Standard tutorials: saves time.

Analytics from videos

- WHO watched WHAT and HOW MUCH?
- Does watching help students?
- Should lecture recording be broken into smaller segments?
- YouTube or not YouTube? (I.e., GLOW?)

Course homepages

My homepage: https://web.williams.edu/Mathematics/sjmiller/public_html/.

Problem Solving Course Homepage: Math 331 (Fall 2017): http://web.williams.edu/Mathematics/sjmiller/public_html/331Sp17/.

Video References

- OIT videos:
  - ◇ Double plus ungood: Discussess applications of Fibonacci numbers to roulette, 6:43 minutes: https://www.youtube.com/watch?v=Esa2TYwDmwA.
  - ◇ Duality: Introduction to duality and linear programming, 3:30 minutes: https://www.youtube.com/watch?v=aMorr1h4Egs.
  - ◇ Tangent lines: Review of tangent lines, 3:33 minutes: https://www.youtube.com/watch?v=lEJ06epMLEQ.

- Course videos: Probability, Complex Analysis, Calculus III: http://web.williams.edu/Mathematics/sjmiller/public_html/videoclasses/index.htm.

- Tutorial videos:
  - ◇ LaTeX: http://www.youtube.com/watch?v=dKUtJpG4Rt0.
  - ◇ Mathematica: http://www.youtube.com/watch?v=g1oj7CIqGM8.
- Calculus videos:
  - ◇ Calculus review: https://www.youtube.com/watch?v=xYzQL0TUtBA.

- Conferences / Talks: http://web.williams.edu/Mathematics/sjmiller/public_html/math/talks/talks.html.

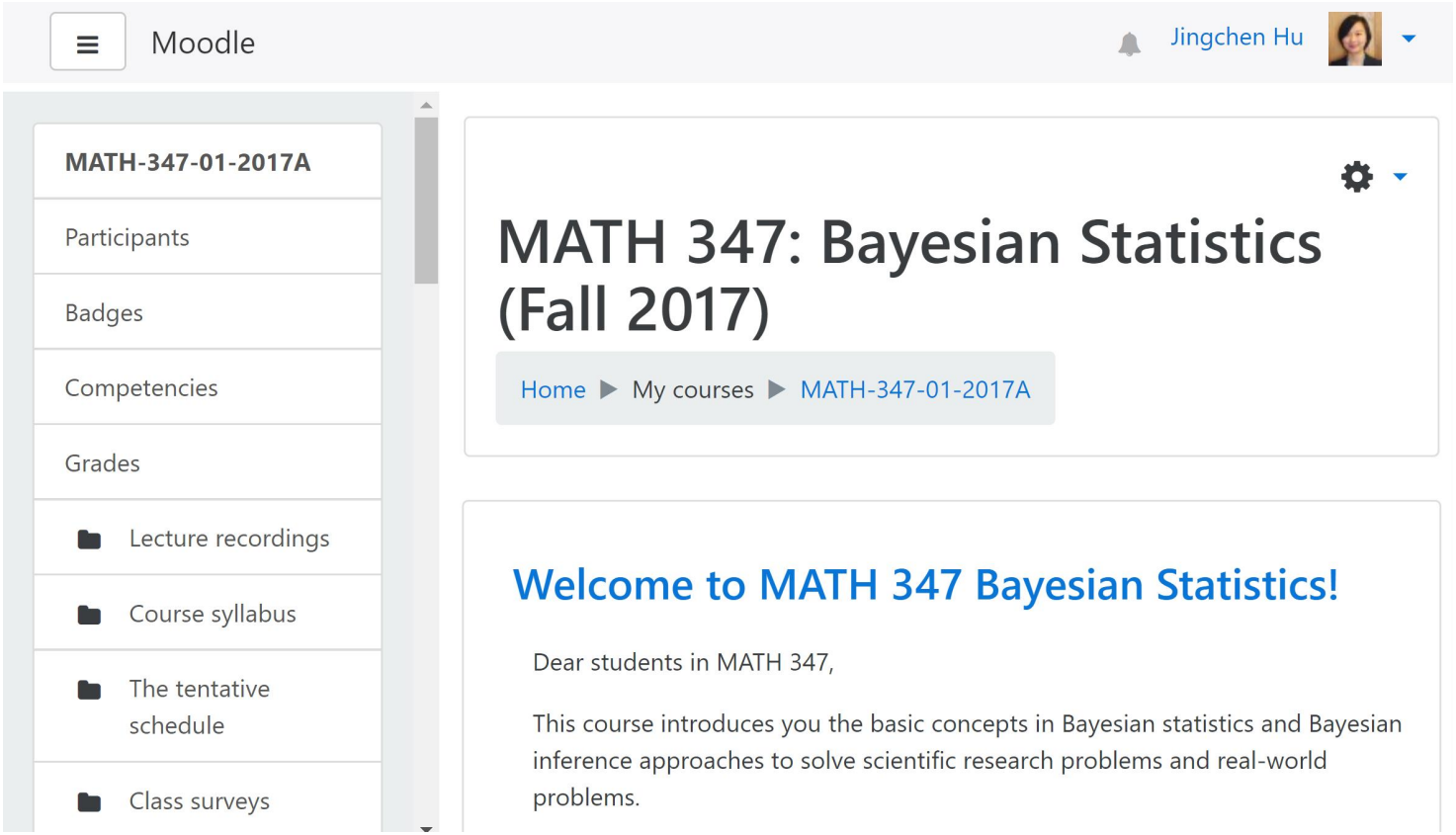
Hu - Bayesian Statistics

Course Mechanics

- Class meetings
  - MW 1:30-2:45pm at Vassar
  - Both synchronized and unsynchronized accesses; lectures posted on YouTube by 5pm
  - One lecture delivered at Swarthmore in week 3
- Office hours
  - Regular office hours for local students (synchronized if requested)
  - Designated online office hours for remote students, meet as a group
  - TA's synchronized office hours
- Grading by instructor and TA

Webpage

- Vassar's Moodle



- Google Docs: sheets
- Google Docs: forms

Webpage

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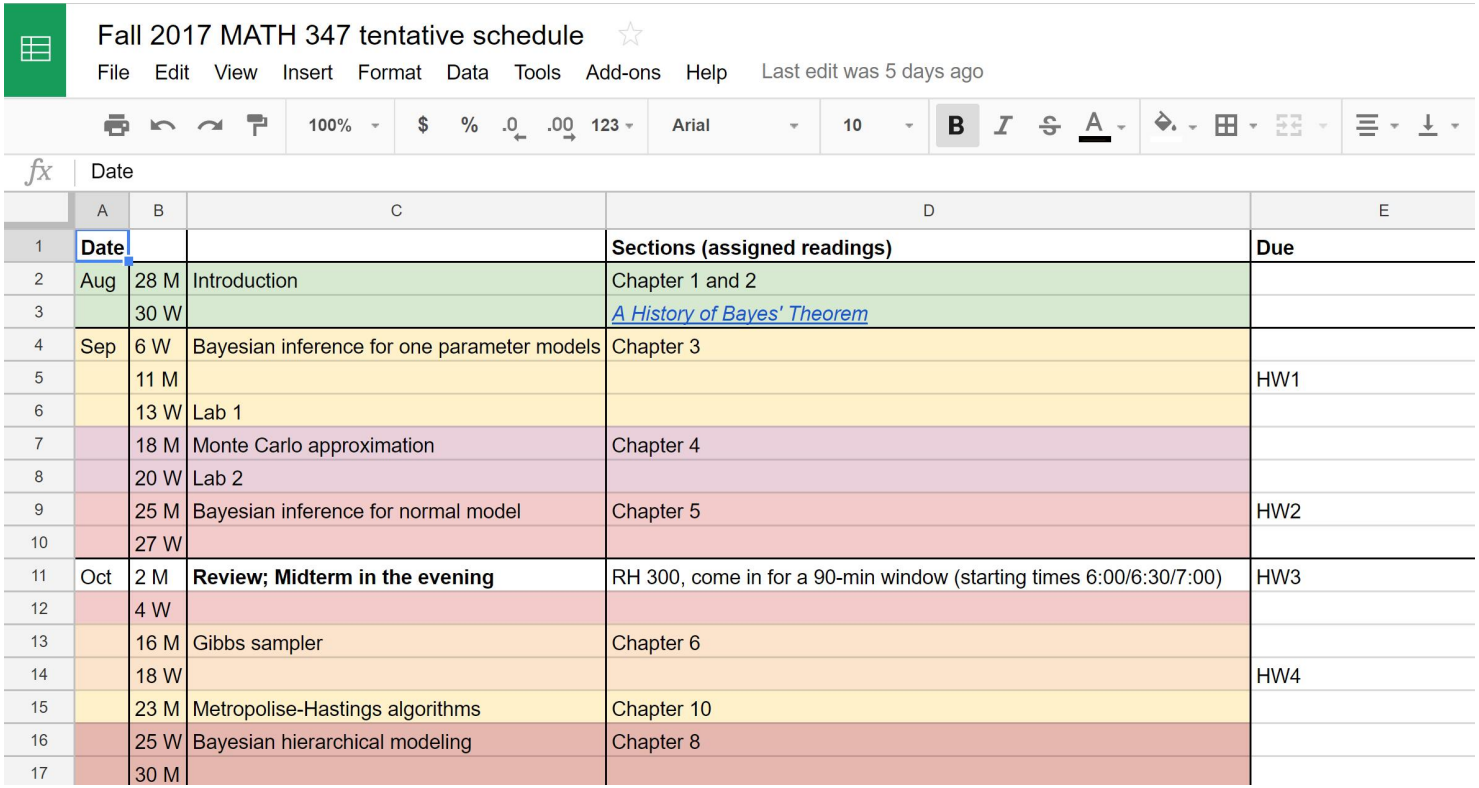
- Google Docs: sheets



Fall 2017 MATH 347 tentative schedule

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fx Date

	A	B	C	D	E
1	**Date**			**Sections (assigned readings)**	**Due**
2	Aug	28 M	Introduction	Chapter 1 and 2	
3		30 W		*A History of Bayes' Theorem*	
4	Sep	6 W	Bayesian inference for one parameter models	Chapter 3	
5		11 M			HW1
6		13 W	Lab 1		
7		18 M	Monte Carlo approximation	Chapter 4	
8		20 W	Lab 2		
9		25 M	Bayesian inference for normal model	Chapter 5	HW2
10		27 W			
11	Oct	2 M	**Review; Midterm in the evening**	RH 300, come in for a 90-min window (starting times 6:00/6:30/7:00)	HW3
12		4 W			
13		16 M	Gibbs sampler	Chapter 6	
14		18 W			HW4
15		23 M	Metropolise-Hastings algorithms	Chapter 10	
16		25 W	Bayesian hierarchical modeling	Chapter 8	
17		30 M			

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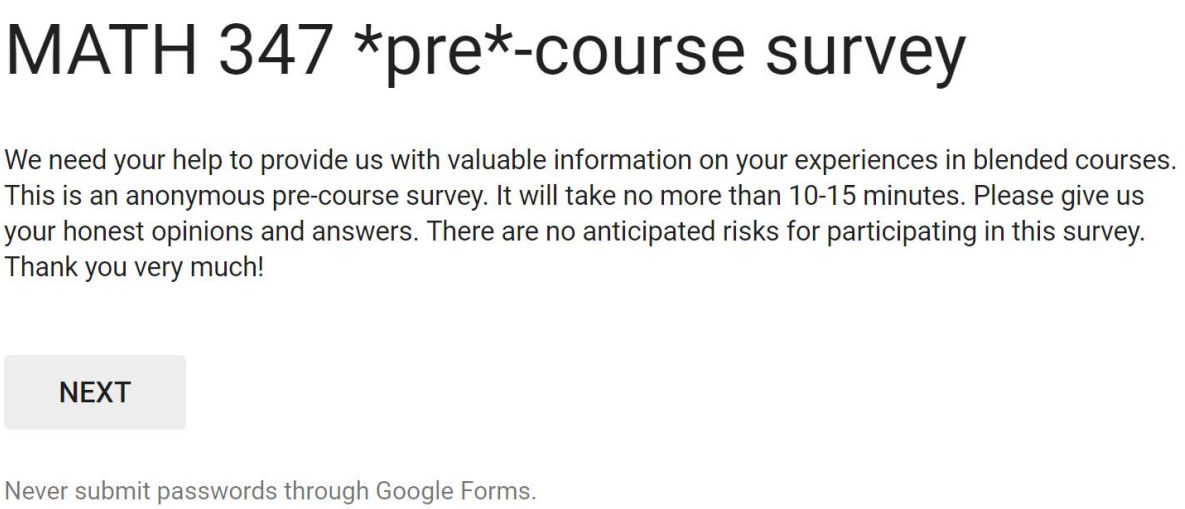


MATH 347 *pre*-course survey

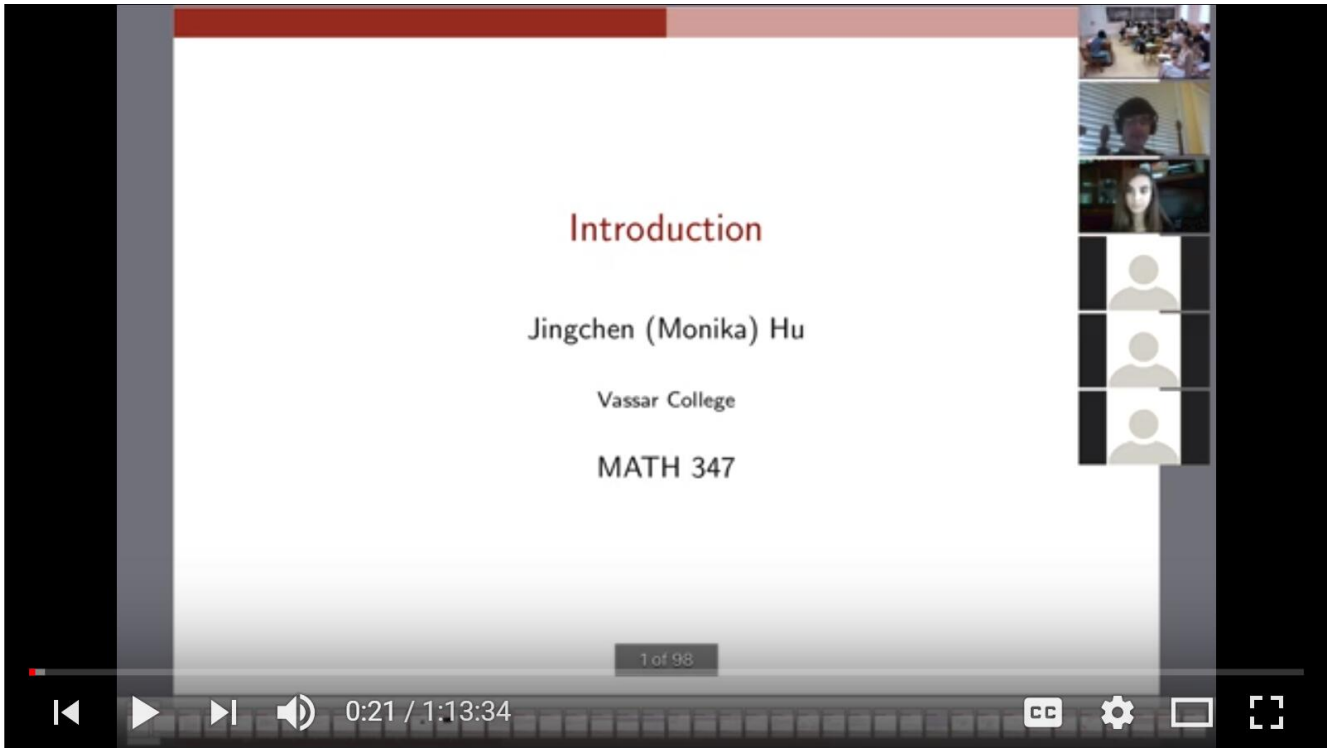
We need your help to provide us with valuable information on your experiences in blended courses. This is an anonymous pre-course survey. It will take no more than 10-15 minutes. Please give us your honest opinions and answers. There are no anticipated risks for participating in this survey. Thank you very much!

NEXT

Never submit passwords through Google Forms.

Equipment: Software Zoom

- slides



- write on slides
- write on white board
- R

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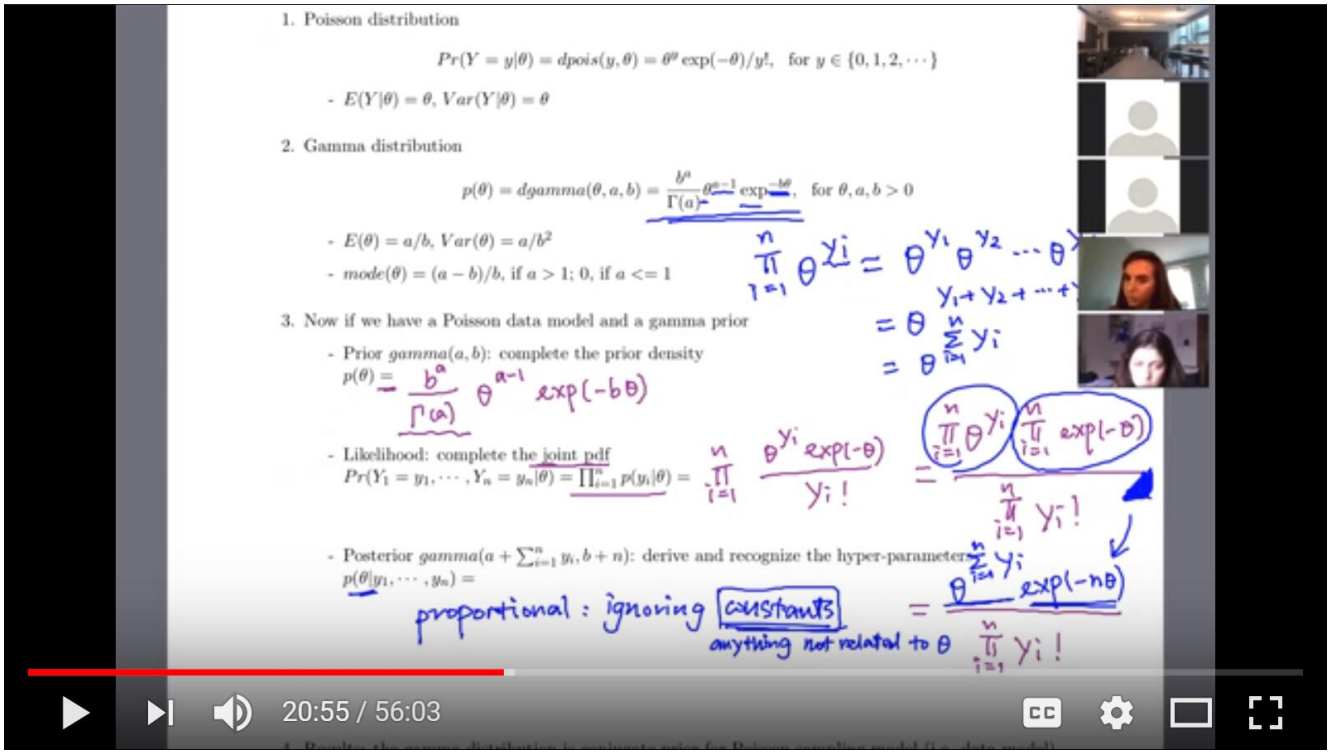

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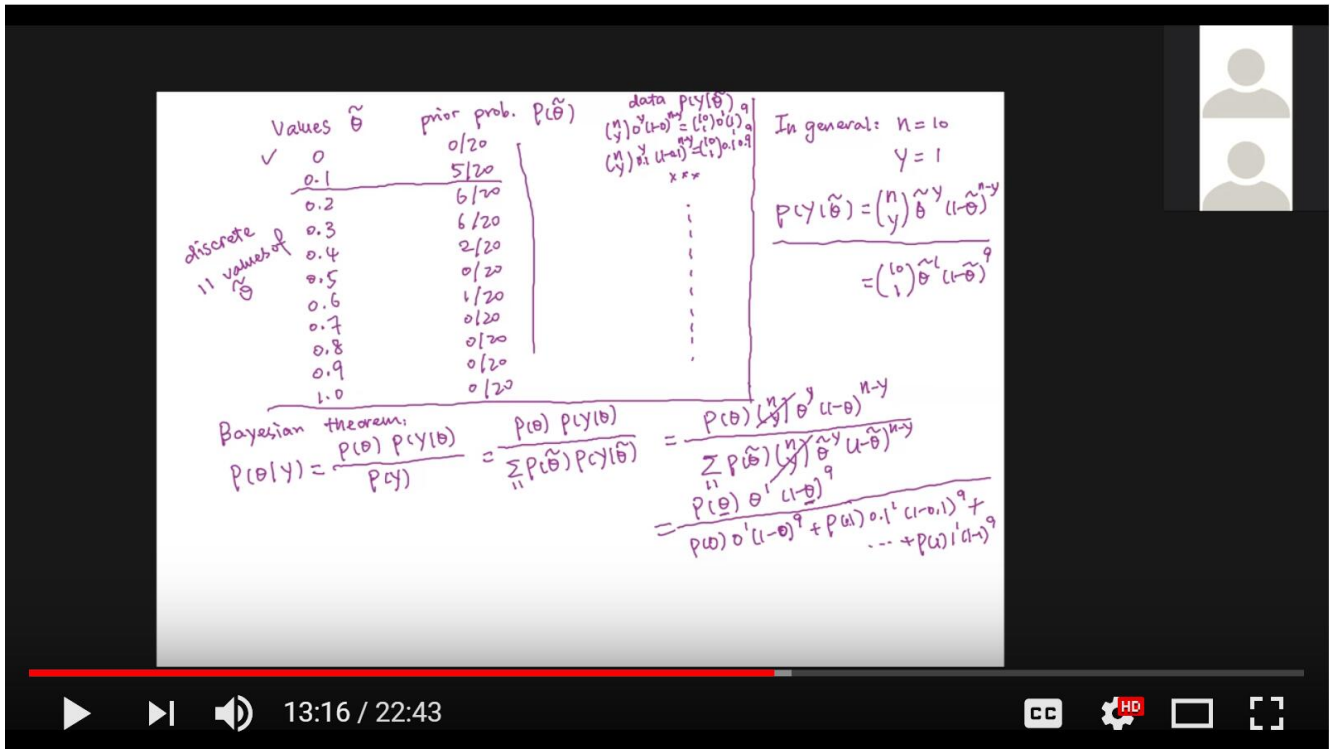

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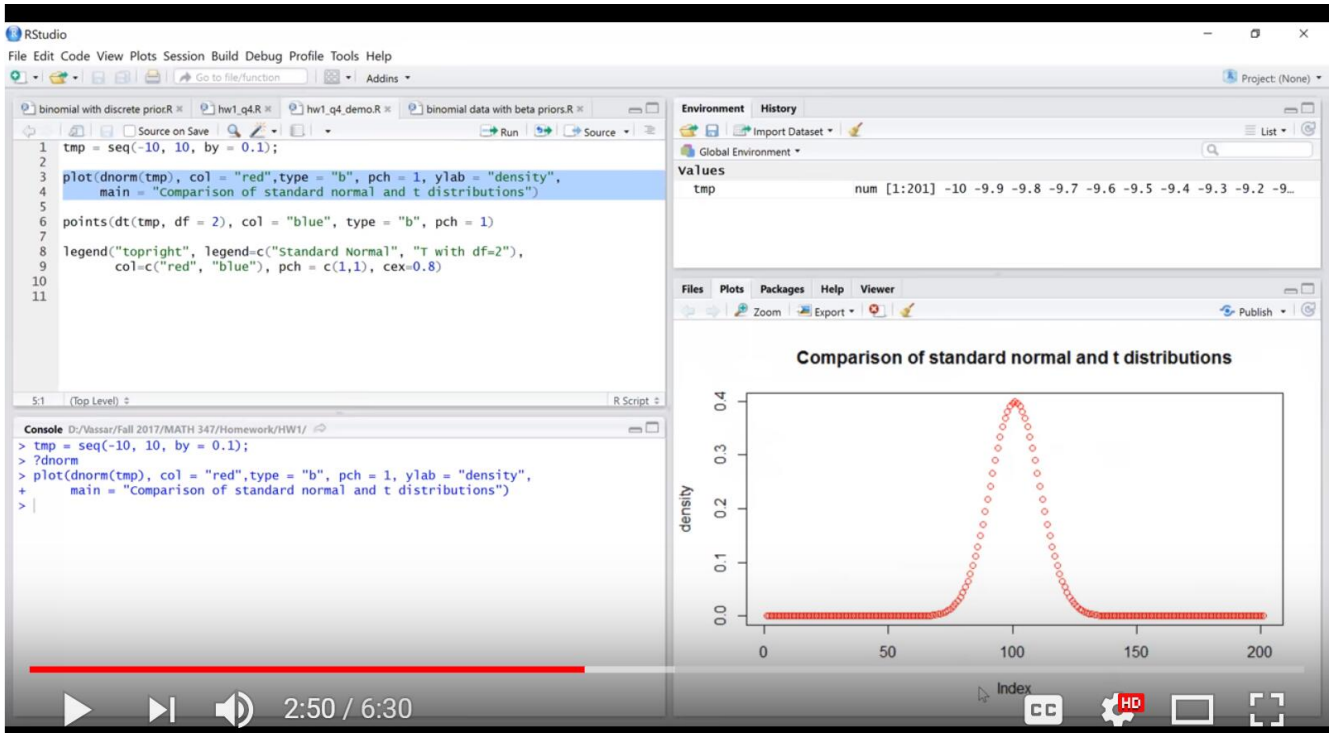

Equipment

- iPad Pro: take control, bring up slides from Dropbox and/or Google Drive
- Apple pencil: write on slides and/or whiteboard on iPad
- Bluetooth headset: instructor can move around
- Directional mic: record students' voice better
- Laptop: take control for R demonstration

Pedagogy challenge: What to move online? In what form?

- Identify appropriate material to move online (video vs reading material?)
  1. review of pre-requisite material
  2. preview of upcoming material: e.g. “guest lecture"
  3. recap from lecture
  4. hint for homework problems

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  2. preview of upcoming material: e.g. “guest lecture"
  3. recap from lecture
  4. hint for homework problems
- Multimedia form (e.g. shorter videos) as a complement and/or alternative to the usual document form
  1. R demonstrations
  2. step-by-step derivations

Pedagogy challenge: Creating an online learning community

- Self introduction posts and project introduction posts

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- Discussion board on Moodle
  1. posting general questions and comments about a section/chapter/homework assignment/R questions
  2. responding to questions from reading/viewing material, case study analyses
  3. sharing resources

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- Create teams of local and remote students to work together (generally not easy)
- Accountability!

Future

Going forward....

- Hollywood level videos great, lot of time and effort but better understanding?
- How much to flip, and how to integrate?
- Split work among several institutions?

Next classes....