Lessons Learned from Running a Distance-Based Course in Data Visualization

Cramér Society Fall Meeting 2021

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October 25, 2021

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Overview

Course Design

Course Content

Lessons Learned

Course Design

Motivation

- Data visualization is an integral part of statistics
  - Exploring data
  - Understanding theory
  - Diagnosing models
  - Presenting results
- Useful in many other professions

Aims

Overall Aim

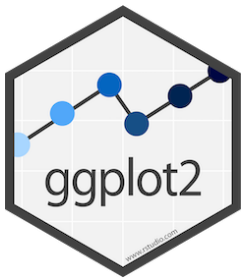
Teach data visualization using modern tools, focusing on both theory and practice but with emphasis on the former.

Design-Specific Specific Aims

- Focus teacher resources on feedback and guidance
- Allow asynchronous progress
- Enable the course to scale well to many students
- Use free (but modern) tools and literature
- Encourage student interaction

Format

- 4 ECTS credits ($\approx$ 10 hours/week)
- Entirely distance-based
- Based on R and the R-package ggplot2
- Platform: Canvas
- Slack workspace for discussions
- Zoom for workshops
- Freely available literature and tools



Course Content

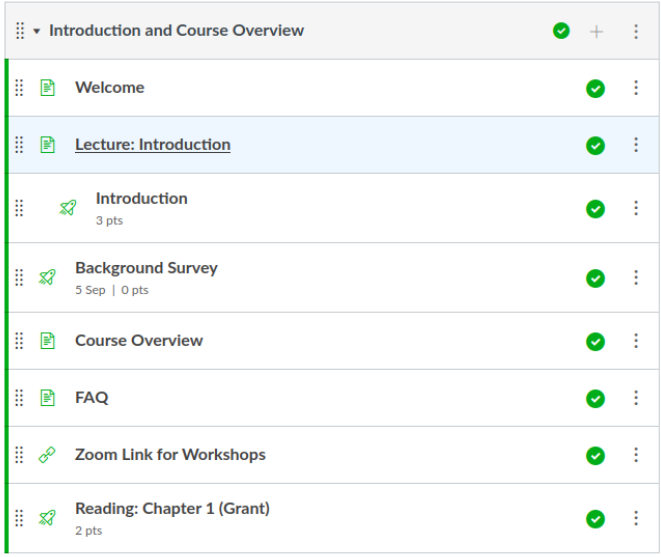
Course Components

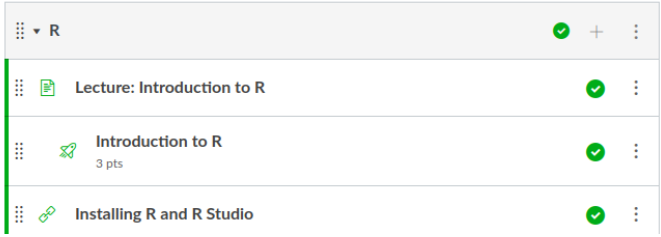
Course Activities

- Pre-Recorded Lectures
- Reading Assignments
- Worked Examples
- Online Workshops

Examination

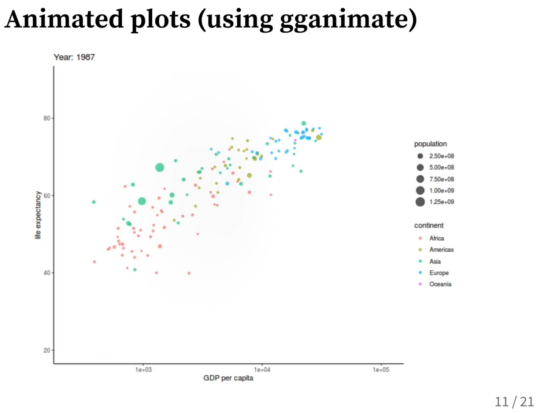
- Quizzes
- Assignments
- Project





Lectures

- Pre-recorded
- Short (5–10 minutes)
- Scripted
- High production values



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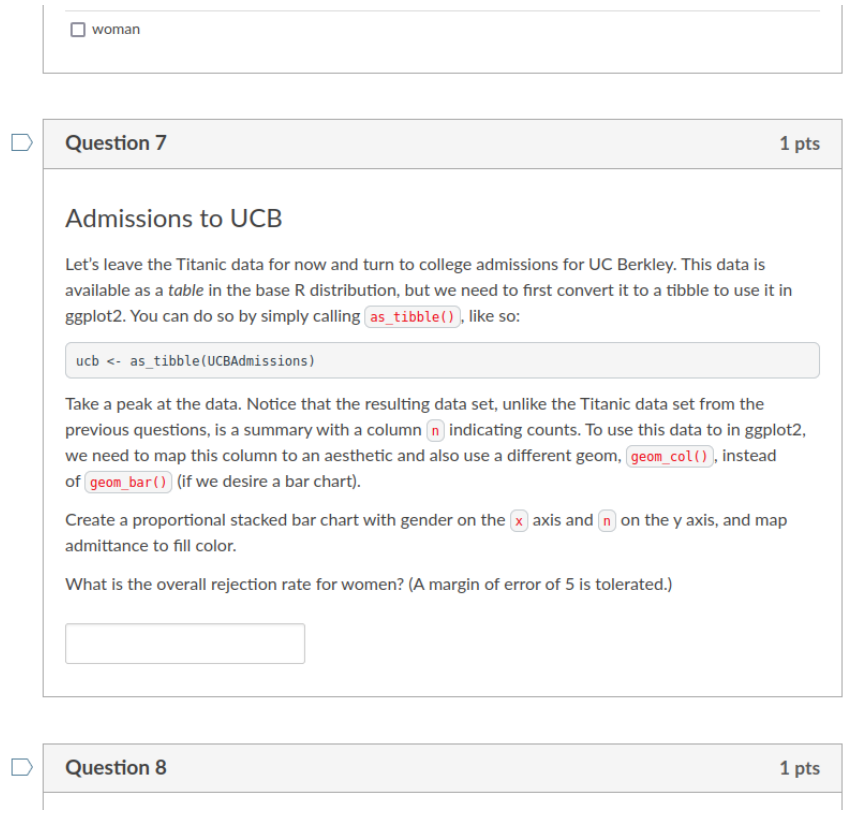
Quizzes

- Three types
  - Lecture quizzes
  - Reading quizzes
  - Practice quizzes
- Mostly automatically graded



☐ woman

Question 7 1 pts

Admissions to UCB

Let's leave the Titanic data for now and turn to college admissions for UC Berkley. This data is available as a *table* in the base R distribution, but we need to first convert it to a tibble to use it in ggplot2. You can do so by simply calling `as_tibble()`, like so:

```
ucb <- as_tibble(UCBAdmissions)
```

Take a peak at the data. Notice that the resulting data set, unlike the Titanic data set from the previous questions, is a summary with a column `n` indicating counts. To use this data to in ggplot2, we need to map this column to an aesthetic and also use a different geom, `geom_col()`, instead of `geom_bar()` (if we desire a bar chart).

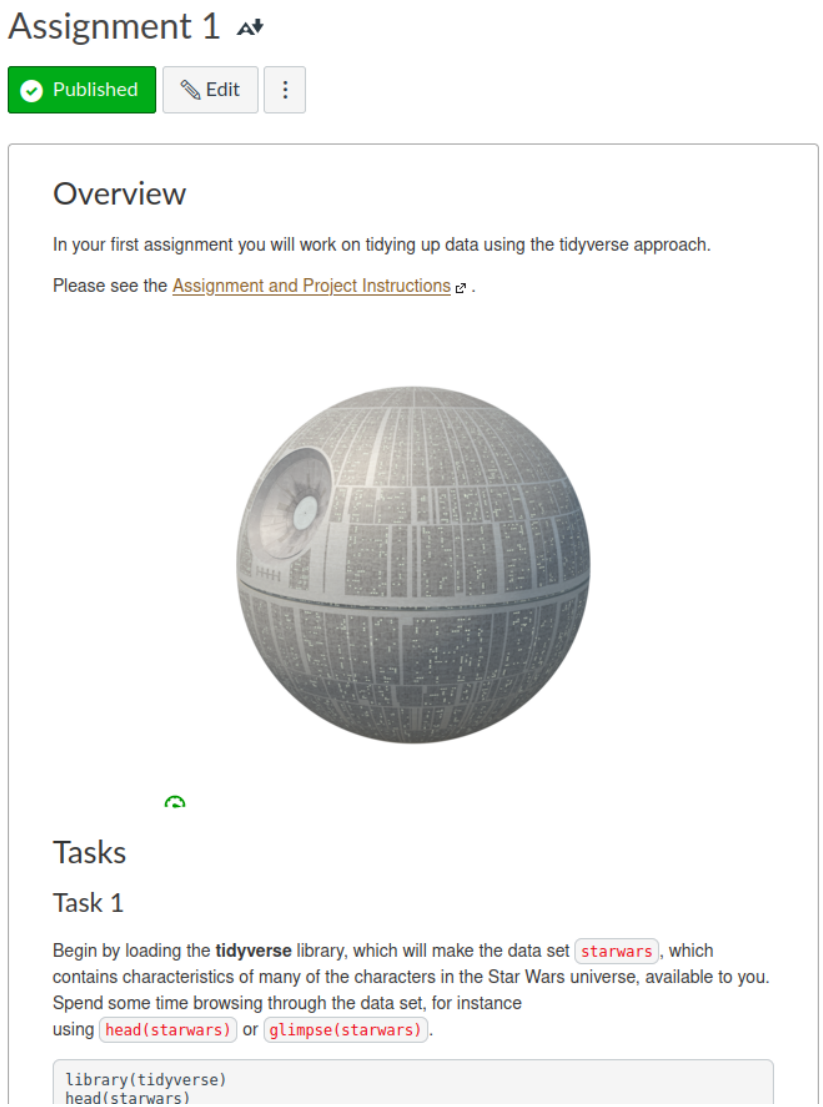
Create a proportional stacked bar chart with gender on the `x` axis and `n` on the y axis, and map admittance to fill color.

What is the overall rejection rate for women? (A margin of error of 5 is tolerated.)

Question 8 1 pts

Assignments

- Three tasks in each
- Progressively freer (and more challenging)
- Peer feedback
- Short feedback loops
- Encourage reproducible submissions (R Markdown)



Project

- Free choice of "research question"
- Free choice of data set (under certain restrictions)
- Large variation in results

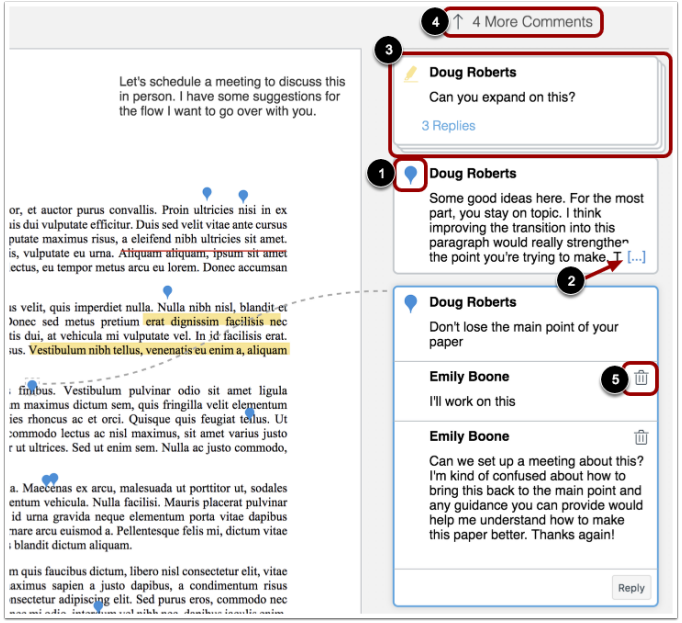
Lessons Learned

Pre-Recorded Lectures: Costly but Worthwhile

- Excellent student response
- Frees up time for real interaction
- Large time investment up-front
- Best for old (stable) courses

Peer Feedback: Great Value

- Saves time
- Fast feedback
- From student perspective works best when assignments are free. Opposite situation from teacher perspective.
- Mixed engagement



Quizzes: Hard to Design, but Useful

- Hard to design automatically graded quizzes (at least for data visualization)
- Easy to lose track of students.
  - Solution: use a few manually graded tasks
- One second attempt seems appropriate, but leads to inflation
- "Encourages" students to actually read course literature

Using R: Feasible but not Frictionless

- Anyone can learn how to use R
- Makes assisting students easier
- Speeds up revisions
- Needs introduction
- Divides students into two groups

Retention

- Register many students! $\approx 50\%$ drop out.
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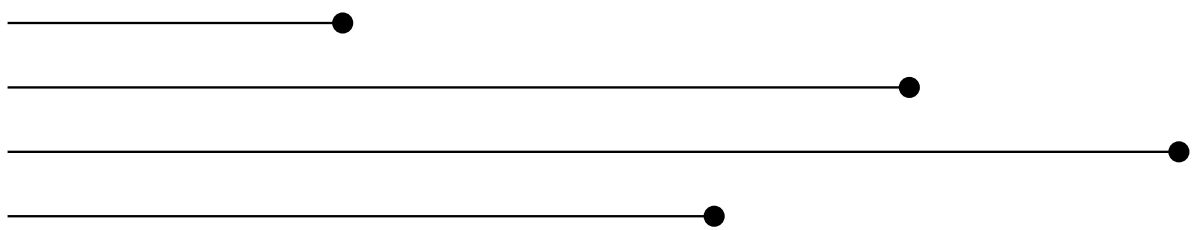
Asynchronicity: A Mixed Bag

- Great for some students
- Does not combine so well with peer (and general) feedback



Conclusions

- Works well overall
- Peer reviews are great
- Quizzes are efficient in stimulating learning
- Automatic grading is useful but hard to design well