Promoting Student Engagement in Introductory Statistics Using Socially Relevant and Real Data

Kathy Kubo, College of the Canyons
Today’s agenda

- Preparation: Build your learning community
- Data visualizations: Activities & project
- More socially relevant & real data examples in our new online materials
Build your learning community
Set the tone from Day 1

- Set class norms
- Embrace group work
- Attend to the affective side of learning
Set class norms

1) What we don’t like about group work

2) What can we do to address these problems

What we don’t like about group work:
- Independent (non-collaborative) number
- Not agreeing (- external pressure
- Not having enough autonomy
to make decisions
- Everyone getting the same grade
- Finding the balance between
being bossy and being helpful
- Miscommunication
- No time outside of class to do work
- Being an interrupter
- Not everyone is held accountable for tasks
- Closed mindedness
- Contrasting personalities
- Some people are not reliable, to do their own part
- When the presentation isn’t divided equally
- Different levels of motivation
- Easy to get side tracked
- Bossy “super chickens”
- Language barrier

What can we do to address these problems?
- Politely call people out (good communication)
- Ask everyone in group for input
- Everyone participates
- Gently remind people to contribute
- Be open to feedback & keep an open mind
- Meeting virtually
- Have patience & have a good attitude
- Try to make people comfortable
- Don’t be selfish/help each other
- Be respectful
- Listen to other people’s opinions
- Don’t be a “sucker chicken”
- Learn about everyone’s strengths
- Have respect for everyone’s life outside of class
- Be committed
- Be prepared and ready to work in a group
Embrace group work

- Start on Day 1
- Random assignment
- Accountability
- Be intentional about providing activities/assessments that benefit from group work
Attend to the affective side of learning

Videos, readings and reflections

- Fixed vs. growth mindset
- Making mistakes
- Grit
- Productive struggle
- Coping with stress
Which topics are you struggling with in Modules 8 & 9?

- Chapter 9, understanding of the regression line
- Correlation coefficients
- My brain isn't smart enough
- 8 how do we know if something is strong or weak?
- These two modules have been the toughest overall
- Chapter 9 fitting the line
- Correlation is not causation, how would I write a sentence explaining the explanatory variable and response variable since x is not a cause of y?
- Clear understanding of the regression line
- Identifying outliers (x,y)
- ALL of it (but it's my fault I have not started the modules yet lol)
- You are SMART!
Share one word to describe how you feel
Be patient
kind
understanding
Create a welcoming and engaging learning environment

- Inclusive for different points of view and skill levels
- Encourage students to support each other
- Ask students how you can best support their learning AND listen carefully
- We are supporting students, not lowering standards
How will you handle challenges?

- Group work
- Sensitive topics (for example: medical issues, eating disorders, gun violence, suicide, sexual assault)
- Misinformation and false data
Encourage students to talk about data

Early and often
Data visualization project

- Build statistical literacy and an inquiry mindset
- Create opportunity for relevant, real-world connections with course content
- Student-driven
- Practice presentation skills
- Strengthen community through sharing interests/passions
Establish a daily routine

Based on New York Times - “What’s Going On in This Graph?

• What do you notice?
• What do you wonder?
• What’s going on in this graph? Write a catchy headline that captures the graph’s main idea.
What's Going On in This Graph?

Graphs, maps and charts from The Times -- and an invitation to students to discuss them live.

How could five voting districts with five voters each be drawn? Here are some examples.
Day 1 group presentations

- 9 to 10 infographics (1 per group) - provided by instructor
- Groups of 3 to 4
- Preparation time: 10-15 minutes
  - What do you notice?
  - What do you wonder?
  - What’s going on in this graph? Write a catchy headline that captures the graph’s main idea.
From Day 2: Warm-up discussion

- 1 infographic (instructor-selected)
  - What do you notice?
  - What do you wonder?
Data visualization project (Week 2)

• Select and present to the class an interesting infographic

  *An infographic is a visual image such as a chart or diagram used to represent information or data.*

• In your presentation, one goal is to help your audience understand the story behind the data. Thus, it’s better to choose an infographic that is embedded in an article with a narrative about the data and its source.

• It's best if you choose a topic that you are very interested in or passionate about. It shows during your presentation!
Data visualization project

- Instructor pre-approval 48 hours before presentation
- Target time: 4-5 minutes, followed by post-presentation Q&A with classmates
- May pre-record (Zoom works well)
- Post-presentation reflection assignment
## Presentation schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Presenter 1</th>
<th>Presenter 2</th>
<th>Presenter 3</th>
<th>Presenter 4</th>
<th>Presenter 5</th>
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<tr>
<td>M 09/07</td>
<td>Labor</td>
<td>Day</td>
<td>Holiday</td>
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<td>W 09/09</td>
<td></td>
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<td>M 09/14</td>
<td>Alycia (COVID-19) +</td>
<td>Claire (serial killers) +</td>
<td>Samantha (retail bankruptcy) +</td>
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<tr>
<td>W 09/16</td>
<td>Holey (CA wildfires)+</td>
<td>Cherry (STD statistics)+</td>
<td>Corinna (racial/ethnic disparities heart disease)+</td>
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<tr>
<td>M 09/21</td>
<td>Lily (wildfires &amp; climate change)+</td>
<td>Devyn (voter turnout)+</td>
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<tr>
<td>W 09/23</td>
<td>Brian (substance abuse)+</td>
<td>Mitchell (Word Mapper)+</td>
<td>Bryce (video games)+</td>
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<tr>
<td>M 09/28</td>
<td>Scarlett (US military spending)+</td>
<td>April (Trump claims-interactive)+</td>
<td>Alex (Athletes taking a knee)+</td>
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<td>M 10/05</td>
<td>Sams (Obesity)+</td>
<td>Sal (DACA)+</td>
<td>Ryan (Colorectal cancer)+</td>
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<td>W 10/07</td>
<td>Jocelyn (History of Pandemics)+</td>
<td>Mio (military demographics)+</td>
<td>Michael (Sleep)+</td>
<td>Jabree (sneakers data)+</td>
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<td>M 10/12</td>
<td>Julio G (teens &amp; depression)-Zoom recording Suzy (gadget addiction)+</td>
<td>Kayla (mapping police violence)+</td>
<td>Cani S (political party affiliation)+</td>
<td>Gisselle (social media)+</td>
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</table>
Keep searching

- Graphics are decorative
- Data is presented in words rather than through graphical displays of information
In September 2020, 44% of Americans had heard at least a fair amount about the phrase ‘cancel culture’

% of U.S. adults who say they have heard __ about the phrase “cancel culture”

<table>
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<th>Not too much</th>
<th>A fair amount</th>
<th>A great deal</th>
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<td>U.S. adults</td>
<td>56</td>
<td>38</td>
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<td>36</td>
<td>18</td>
<td>24</td>
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<td>50-64</td>
<td>64</td>
<td>46</td>
<td>18</td>
<td>20</td>
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<tr>
<td>65+</td>
<td>67</td>
<td>46</td>
<td>21</td>
<td>21</td>
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<tr>
<td>HS or less</td>
<td>68</td>
<td>49</td>
<td>19</td>
<td>16</td>
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<tr>
<td>Some college</td>
<td>53</td>
<td>36</td>
<td>17</td>
<td>21</td>
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<tr>
<td>College+</td>
<td>44</td>
<td>26</td>
<td>18</td>
<td>29</td>
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<tr>
<td>Rep/Lean Rep</td>
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<td>40</td>
<td>16</td>
<td>20</td>
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<tr>
<td>Conservative</td>
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<td>35</td>
<td>16</td>
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<tr>
<td>Mod/Liberal</td>
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<td>48</td>
<td>16</td>
<td>16</td>
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<tr>
<td>Dem/Lean Dem</td>
<td>54</td>
<td>35</td>
<td>19</td>
<td>24</td>
</tr>
<tr>
<td>Conserv/Mod</td>
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<td>45</td>
<td>21</td>
<td>19</td>
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<tr>
<td>Liberal</td>
<td>41</td>
<td>23</td>
<td>17</td>
<td>29</td>
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Source: Official data collected by Our World in Data. This data is only available for countries which report the breakdown of doses administered by first and second doses in absolute numbers.
Fall 2021

EXHIBIT 2.5: Estimates of Homeless Individuals
By State, 2020

Figure 1. National Drug-Involved Overdose Deaths*
Number Among All Ages, by Gender, 1999-2019

*Includes deaths with underlying causes of unintentional drug poisoning (X40–X44), suicide drug poisoning (X60–X64), homicide drug poisoning (X85), or drug poisoning of undetermined intent (Y10–Y14), as coded in the International Classification of Diseases, 10th Revision. Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple Cause of Death 1999-2019 on CDC WONDER Online Database, released 12/2020.
Fall 2021
Grading rubrics
Post-presentation reflection

- Included in the project instructions
Our new online professional development content (Canvas)
Our facilitator team

Dr. Roxy Peck, Cal Poly, San Luis Obispo
Scott Fallstrom, MiraCosta College
Kathy Kubo, College of the Canyons

With generous support from
The California Community Colleges Chancellor’s Office
Our instructional framework


GAISE Recommendations
1. Teach statistical thinking
   a. Teach statistics as an investigative process of problem-solving and decision making
   b. Give students experience with multivariable thinking
2. Focus on conceptual understanding
3. Integrate real data with a context and purpose
4. Foster active learning
5. Use technology to explore concepts and analyze data
6. Use assessments to improve and evaluate student learning
Recommendation 3: 

*Integrate real data with a context and a purpose*
Canvas structure

- Introductory Module

- Module 1 - Estimated time: 60 minutes
  Prerequisites: Introductory Module

- Module 2 - Estimated time: 60 minutes
  Prerequisites: Introductory Module

- Module 3 - Estimated time: 60 minutes
  Prerequisites: Introductory Module

- Module 4 - Estimated time: 60 minutes
  Prerequisites: Introductory Module
Topics

“What’s in your water?”
Hypothesis testing with water quality in Michigan

“Modeling fire spread”
Linear regression with California wildfire prediction

“Telling a story with infographics”
Visualizing data

“What are the chances?”
Probability with context and limited formulas
Flint (and now) Benton Harbor water crisis

Scott Fallstrom
MiraCosta College
Modeling fire spread

<table>
<thead>
<tr>
<th>Modeling Fire Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Activity by Roxy Peck</td>
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Wildfires are unplanned fires that burn in natural areas like forests, grasslands, or prairies. They often spread quickly and can move into residential areas. Wildfires can be devastating to both natural areas and communities, creating major ecological and economic damage.

A wildfire risk analysis conducted in 2021 found that in California alone, more than 2 million properties were at high to extreme wildfire risk.

Scientists use mathematical models to try to predict where wildfires might start and how they spread.

Photo by Benjamin Lizardo on Unsplash

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Dr. Roxy Peck
Cal Poly, San Luis Obispo
Telling a story with infographics

Kathy Kubo
College of the Canyons
What are the chances?

Alternatives to the traditional approach to teaching probability

Dr. Roxy Peck
Scott Fallstrom
What's in each module?

- Module 4 - Background and Objectives
  - View
- Activity and Reflections
- Module 4 - Main activity and Embedded Video
- Review and Resources
- Module 4 - Resources
Highlights

● 4 modules (approximately 1 hour each)
● Video walkthrough
● Class activities
● Teaching tips/troubleshooting issues
● Additional resources
● Badges awarded after module completion (total of 4)
Available in early 2022

Tentative launch: February 2022
Join us online 01/29/22

Winter 2022
Chancellor’s Office
Statistics Institute workshop
Any questions?
Thank you!

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