Learning Statistics through Social Justice

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Introduction

Students and faculty from Cal Poly in collaboration with Education Development Center (EDC), a global nonprofit organization, are working to develop and implement lessons for high school students to learn statistics concepts through the context of social justice issues.

Goals

Create lessons that would:

1. Help non-STEM focused high school students develop statistical thinking and scientific argumentation skills.
2. Motivate high school students to see the importance of statistics by using relevant, publicly available data from the U.S. Census and American Community Survey (ACS).

Topics

Immigration Module:

a) Exploring immigration rates and trends over time and region.

b) Stats topics: percentages, categorical variables, multivariable thinking.

Income Inequality Module:

a) Part 1: Measuring income inequality and exploring how income distributions have changed over time.

b) Part 2: Comparing income distributions between males and females, is the wage gap explained by levels of education?

c) Stats topics: median, mean, skewness, variability, multivariable thinking.

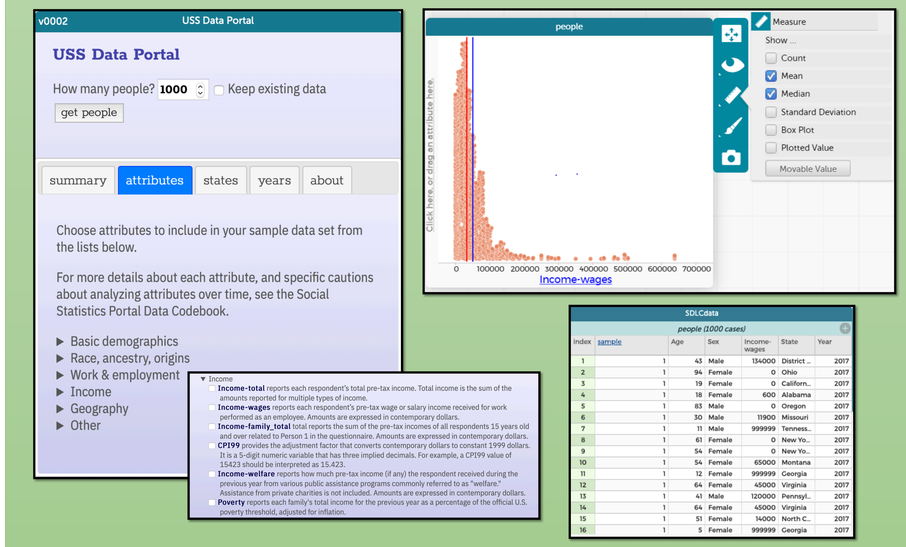
Implementation

Boston: Seven high school math classes (Roughly 7 one-hour lessons + a multi lesson team investigation)

Los Osos: Summer high school history class (Roughly 6 one-hour lessons + a multi lesson team investigation)

Upward Bound: Summer enrichment program (2 two-hour abbreviated lessons)

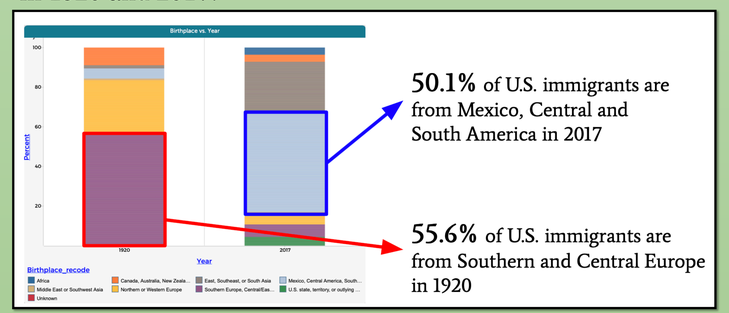
Common Online Data Analysis Program (CODAP)



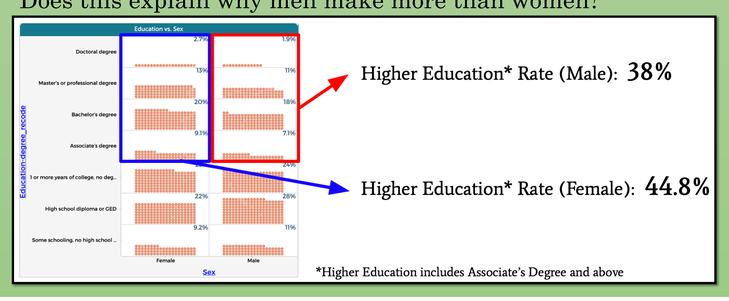
- The USS Data Portal allows students to choose different variables into their data table by extracting data from the ACS.
- The students use this data to create dot plots and analyze distributions.
- CODAP allows students to visually see measures of center and variability directly on the distribution.

Lessons

1. **Immigration Module - Lesson 2:**
From which world region did more U.S. immigrants come from in 1920 and 2017?



2. **Income Inequality Module - Lesson 4:**
Are men more highly educated than women?
Does this explain why men make more than women?



*Frost Research Fellows
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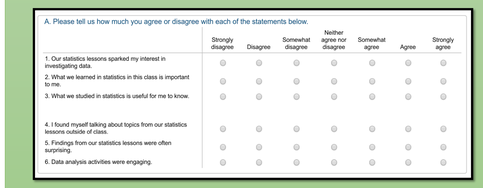
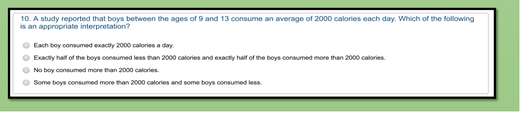
Assessments

Types of Assessment:

- Attitudes – 23 questions, 7-point Likert scale
- Content knowledge – 23 questions, multiple choice
- Focus Group – 4 students from Los Osos, attitudinal and conceptual questions.

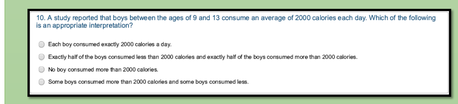




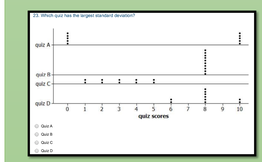
Results

Concept Understanding:

- Improvement on mean and median
- No improvement on standard deviation and variability



Question 10 (Mean)
71% correctly chose D
18% incorrectly chose A,B
11% incorrectly chose C



Question 23 (Variability)
39% correctly chose A
22% incorrectly chose B (higher mean)
25% incorrectly chose C (more variety)
14% incorrectly chose D (bumpier)

Attitude: 69.24% of students in Boston and 73.69% of students in Los Osos responded Somewhat Agree or higher to the statement "I could relate to the topics in our statistics lessons."

Student testimony:
"...we...liked learning about it, because we both come from Hispanic parents and my grandparents were immigrants and this is really interesting to see how things are..."
Student from Los Osos

Future Inquiry

- How can we increase student understanding of the importance of variability within distributions?
- The social science topics used in the lessons were engaging. What other topics would encourage students to learn more about statistics?

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