Building Statistical Thinking with Social Justice Investigations and Social Science Data

The Need: In today's data-driven world, innovation, scientific progress, and the health of civil society demand a data-literate citizenry and a workforce with strong statistical thinking skills. Studies show, however, that schools are neither preparing students adequately nor drawing enough students —particularly from traditionally underserved groups — to data science fields.

The Intervention: The **Strengthening Data Literacy across the Curriculum (SDLC) project** is developing and studying curriculum modules for non-AP high school statistics classes to promote interest and skills in statistical thinking and data science among diverse high school populations. This early-stage design and development project aims to engage students with data investigations that focus on issues of social justice, using large-scale socioeconomic data from the U.S. Census Bureau and student-friendly online data visualization tools. Primary social justice topics are income inequality and immigration in the U.S.

Research Questions

- What is the feasibility of implementing SDLC modules in high school non-AP statistics and mathematics classes?
- In what ways do SDLC modules and their components support students' interests in and learning of statistical concepts and practices?
- To what extent do students who use SDLC modules show improved understandings of important statistical concepts and greater interest in statistics and data analysis?

Research Design

- Design-based and mixed-methods
- 2018/19: Iterative development & alpha testing
- 2019/20: Iterative development & beta testing
- 2020/21: Data analysis & dissemination

Participants

- 2018/19: 5 high school non-AP statistics teachers; 5 high school social studies teachers; 170 students (gr. 12)
- 2019/20: 10 high school teachers of non-AP statistics; over 300 students (gr. 12)
- Schools have high % of students who are Black, Latinx, low-income, and ELs in Boston, MA region

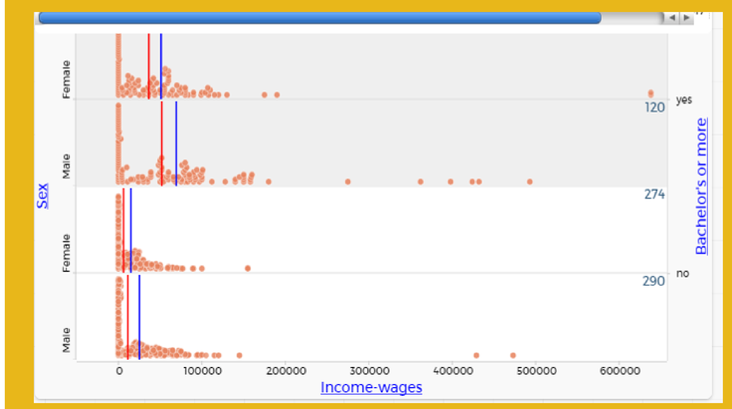
Data

- Classroom observations
- Teacher implementation logs
- Teacher focus group & individual interviews
- Student focus group interviews
- Student work samples
- Pre- and post-module assessments
  - LOCUS (Jacobbe et al., 2014)
  - Academic Interest (Linnenbrink-Garcia et al., 2010)

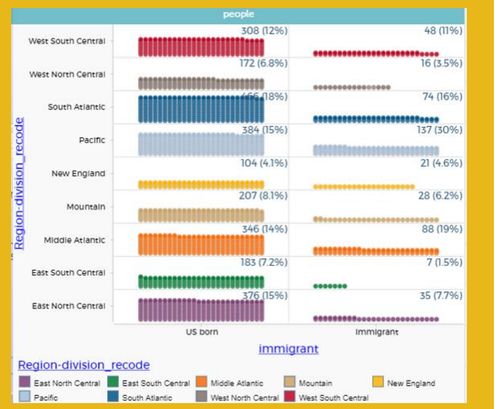
Analysis

- Qualitative data: *A priori* and open coding to identify unit implementation successes, challenges, improvements, and to examine conjectures linking curriculum design features with student outcomes
- Quantitative pre/post assessments: Matched-pair dependent sample t-tests; OLS regression to explore association between post-test scores and unit implementation, controlling for pre-test

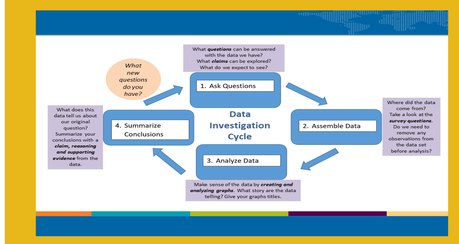
SDLC is developing high school curriculum modules that integrate social justice topics with statistical data investigations to promote skills and interest in data science among underrepresented groups in STEM.

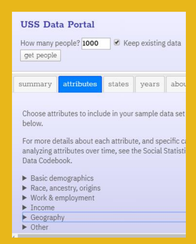


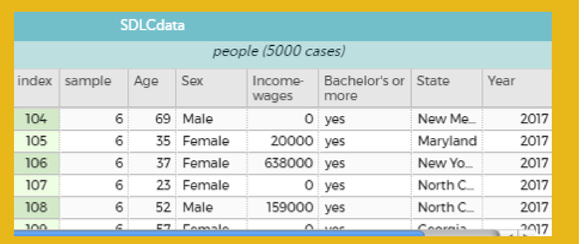
Income Inequality



Immigration







Statistical Thinking & U.S. Census Data

Initial Findings

"[The statistics learning experience] was very different, although I will say I enjoyed it more just because it was more akin to the real world and it had more to do with stuff that you see on the news or that you hear. Everyone needs to know about income and what you make and what you expect to make and how you need to live off it, so that was very helpful, and then immigration is interesting and it's just very good to know and to have educated opinions on. I thought it was just really interesting compared to the regular put-numbers-on paper-and-see-what-comes-out."
- *Grade 12 focus group student A*

"It helped me put the pieces together when people say you'll never use this in the real world. This was very helpful to understanding and it made me have a new appreciation for math and especially statistics in general. It just helped me be way more engaged throughout the year, and this was probably the most fun I've had in math in a very long time and the most interesting thing I've done in years."
- *Grade 12 focus group student B*

Project Team

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