Data Detectives Clubs in the time of COVID-19

Paderborner Kolloquium
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Link to these slides: https://bit.ly/3C5Svyf

Our approach: Data Detectives Clubs

Introduce youth to data science & epidemiology through 20-hour out-of-school experience centered on an adventure book. The two anchors are the book and the data activities.

- Most chapters are accompanied by data activities
- Digital data activities are done in CODAP/NetLogo
- Social-emotional learning and public-health decision-making are incorporated
- Youth do project using epidemiological data to make help policy-makers make a decision
- Youth learn about epidemiology and data-based careers through the book and virtual visits

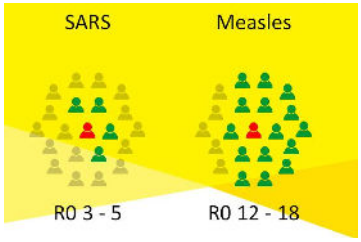
The adventure story as one anchor

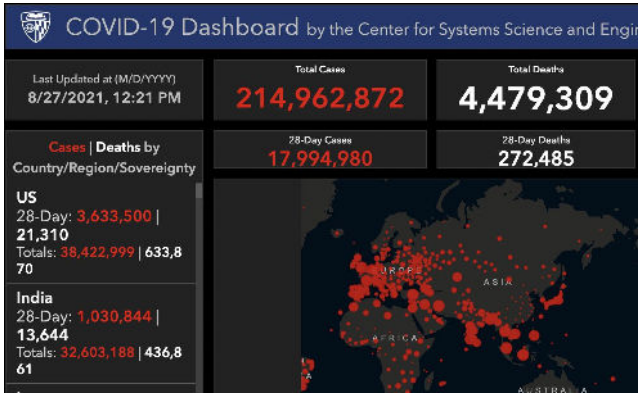
- Why a story? – Curiosity, connection, empathy
- What the story is: a journey through space and time
- The story is evolving
- Chance to address children's fears and concerns

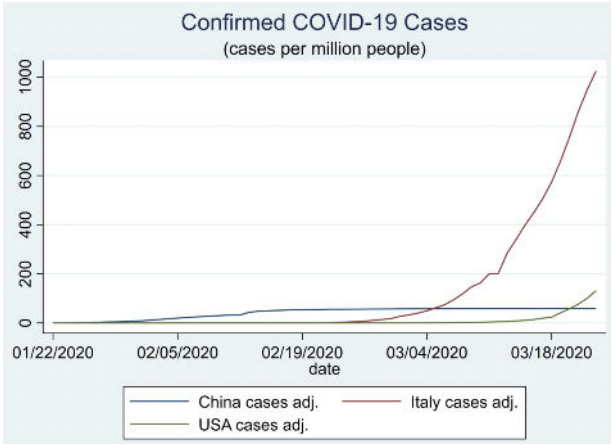
Data activities as the second anchor

- Data activities using CODAP accompany most of the chapters
- Data are about different pandemics (Ebola, smallpox, 1918 flu), but most of the data are about COVID.
- We start by posing questions
- Youth ask their own questions about patterns, relationships, and change over time.

Background



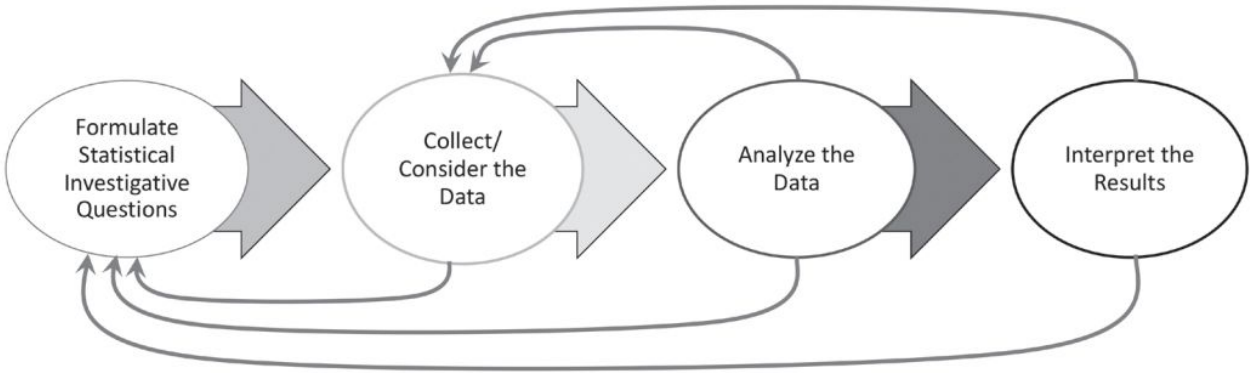




- Epidemiology is rooted in data science
- Epidemiology uses time series data, multivariate data, rates, probability, and R0
- American youth typically do not learn about either epidemiology (Bracken, 2014) or using large datasets (Finzer, 2013) in science classes

Data science framework

- Investigative process from Guidelines for Assessment and Instruction in Statistics Education II (GAISE II, 2021, p. 13)



GAISE II increased areas of emphasis (pp. 8–11)

- The role of technology in statistics
- Questioning throughout the statistical problem-solving process
- Different data and variable types
- Multivariate thinking
- Probabilistic thinking

Humanistic data science framework

(Lee, Wilkerson, & Lanouette, 2021)

- **Personal layer:** Direct experiences with designing and generating data, and with the phenomena and contexts.
- **Cultural layer:** Norms relating to how datasets are constructed and used, including the use of technology & cultural practices of different disciplines (in our case, epidemiology)
- **Sociopolitical layer:** Political and social forces that affect how data are constructed and interpreted.

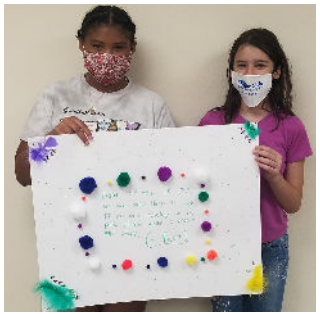
Mae and Clinton visit Dr. Anthony Fauci in Washington, DC

Implementation

imagine science | INSPIRING THE NEXT GENERATION OF STEM LEADERS
Boys & Girls Clubs of America • Girls Inc. • National 4-H Council • Y-USA

Imagine Science is implementing the 20-hour Data Detectives Clubs program *(70% minority youth, 60% low income, 49% girls)*

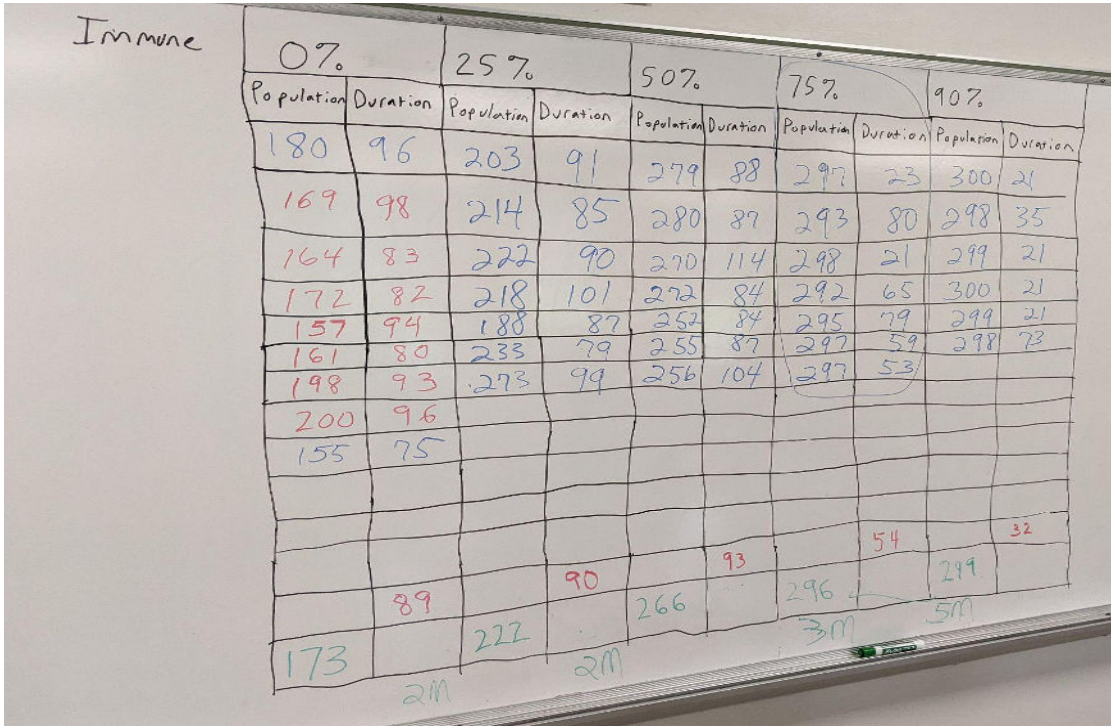
- To date: 30 clubs with 450 youth (ages 10 to 14) involved in 7 communities (6 US states)
- Leaders of clubs get 6 hours of professional development
- Youth work is collected, especially data-rich artifacts
- Post-club survey data about STEM and data science attitudes, dispositions, and identity is also collected
- Post-club focus groups are conducted with youth and with leaders



A Simulation of an Epidemic:
bit.ly/CCCODAPNetLogo

- Using NetLogo Web, a multi-agent programmable modeling environment from Northwestern University, US
- Embedded in the Common Online Data Analysis Platform (CODAP)
- Free, browser-based with no installation or login

Variation in simulations



Parameters used
Population at start: 300
Survival rate: 50%
Duration of illness: 21 days
R_0 (infectivity rate): 5

Learning Experiences Emerging from Working with a Stochastic Simulation with Data Output

- Noise!
- Search for a signal
- Play ⇒ Experimentation
- Variation within groups versus variation between groups
- Decisions about what to measure
- Transfer to real world

The Beauty of Data Portals: bit.ly/DDCODAPportal

- Some portals can be made to be always up to date by leveraging work of institutions like the US CDC
- Learners can choose from a very large dataset the portion of most interest to them
- Portals can be created for particular learning contexts (like the Data Detective Clubs)
- Simplicity can be a goal
- The richness of the data makes a given portal useful for multiple learning contexts

Research questions

1) What changes do youth experience with respect to STEM identity, STEM career interests and STEM engagement as a result of their participation? Special emphasis on the data science part of STEM.
2) How do youth use datasets/data tools to study infectious disease spread? How do they ask questions, examine patterns, use models, make predictions?

Our research on Question 2: “The Mission”

- How do youth use datasets/data tools to study infectious disease spread?
- Youth are given a mission directly from one of the characters in the book (Selectra Volt)
- Youth use data from the portals
- Data-based arguments for community health decisions

Challenges and questions for discussion

- A challenge is to make Club materials more data-rich while simultaneously engaging youth in the narrative and activities.
- Leaders need more time to learn about data and CODAP
- COVID data change as we are developing materials
- Will the project continue be relevant as COVID evolves?
- Does the project have cross-cultural relevance?

Danke!

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Project partner logos:

Selected references

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