**NC STATE** UNIVERSITY
College of Education
Friday Institute for Educational Innovation

# Let's Talk: Supporting Classroom Discourse and Argumentation while Investigating Data

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October 27, 2023

# InSTEP

**Invigorating Statistics and Data Science Teaching through Professional Learning**


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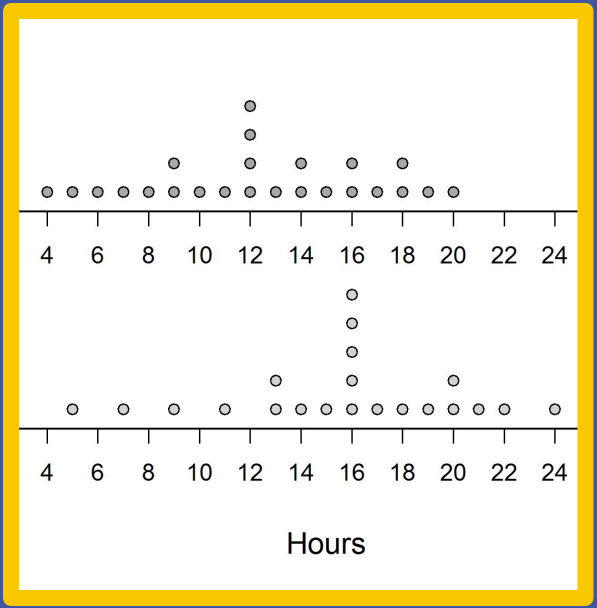
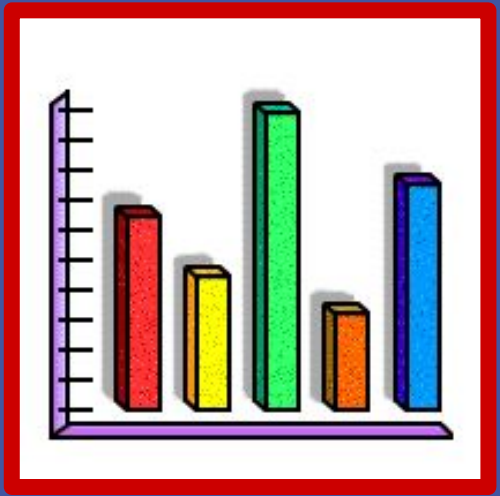
# Access links we will use today

http://bit.ly/2023NCTM

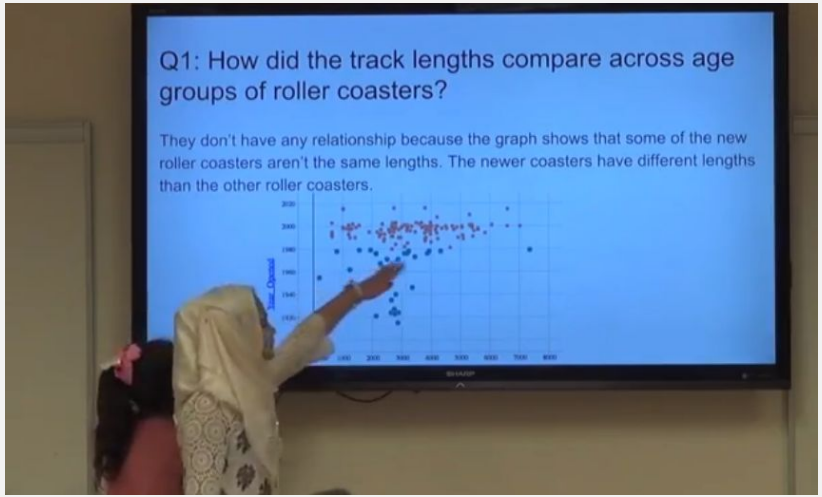


# What are the typical experiences students have in learning statistics in school?

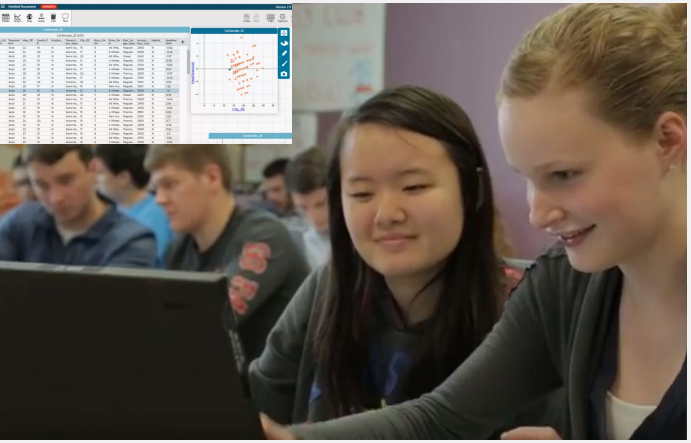
## Large and Messy
(Kochevar)

## Awash in Data
(Finzer & Erickson)




## Requires use of Technology

# Complex Data



## Real Contexts

# Data Investigation Process

**Holistic, Dynamic and Nonlinear**

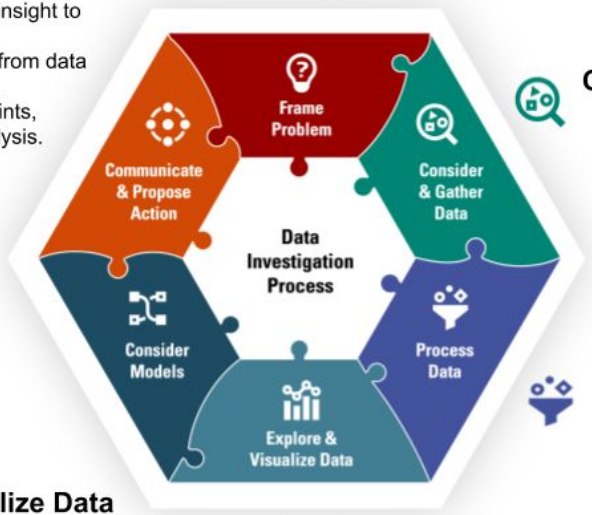
InSTEP

## Frame Problem

- Consider real-world phenomena & broader issues related to problem.
- Pose investigative question(s).
- Anticipate potential data and strategies.

## Communicate & Propose Action

- Craft a data story to convey insight to stakeholder audiences.
- Justify claims with evidence from data and propose possible action.
- Address uncertainty, constraints, and potential bias in the analysis.




## Consider & Gather Data

- Understand possible attributes, measurements, and data collection methods needed for the problem.
- Evaluate and use appropriate design and techniques to collect or source data.
- Consider sample size, access, storage, and trustworthiness of data.

## Consider Models

- Analyze and identify models that address the problem.
- Consider assumptions and purpose of the models.
- Recognize possible limitations.

## Process Data

- Organize, structure, clean, merge, and transform data in efficient and useful ways.
- Consider additional data cases or attributes.

## Explore & Visualize Data

- Construct meaningful visualizations, static or dynamic.
- Compute meaningful statistical measures.
- Explore and analyze data for potential relationships or patterns that address the problem.

## Key Considerations & Dispositions

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Make sense of data with respect to context | Take advantage of technology | Attend to variability & uncertainty | Seek expertise & information | Communicate & collaborate | Be curious creative, & intuitive | Persist & be resilient | Consider ethical issues & biases | Be a skeptic |

Gemma Mojica, Hollylynne Lee, Emily Thrasher, Zachary Vaskalis, and Greg Ray. (2021). The data investigation process classroom poster. In Invigorating Statistics Teacher Education through Professional Online Learning, Friday Institute for Educational Innovation: NC State University. Available at: http://cdn.instepwithdata.org/DataInvestigationProcessPoster.pdf

# Discourse and Data Visualizations

Making sense of visualizations in your classroom

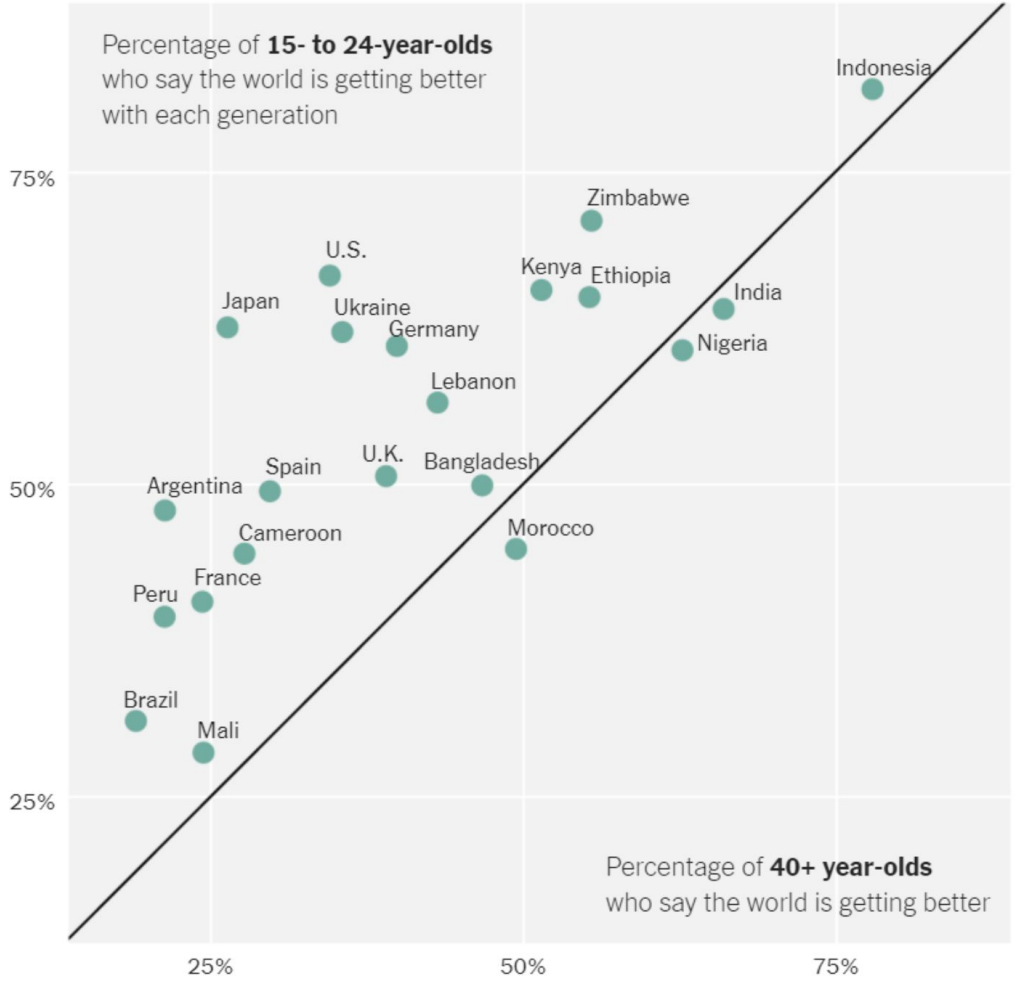
**Take a look at this graph from the New York Times**

What do you notice?

What do you wonder?

The New York Times

https://www.nytimes.com/2022/02/03/learning/whats-going-on-in-this-graph-feb-9-2022.html




Source: UNICEF-Gallup survey of more than 21,000 people conducted by telephone in 21 countries between February and June 2021.

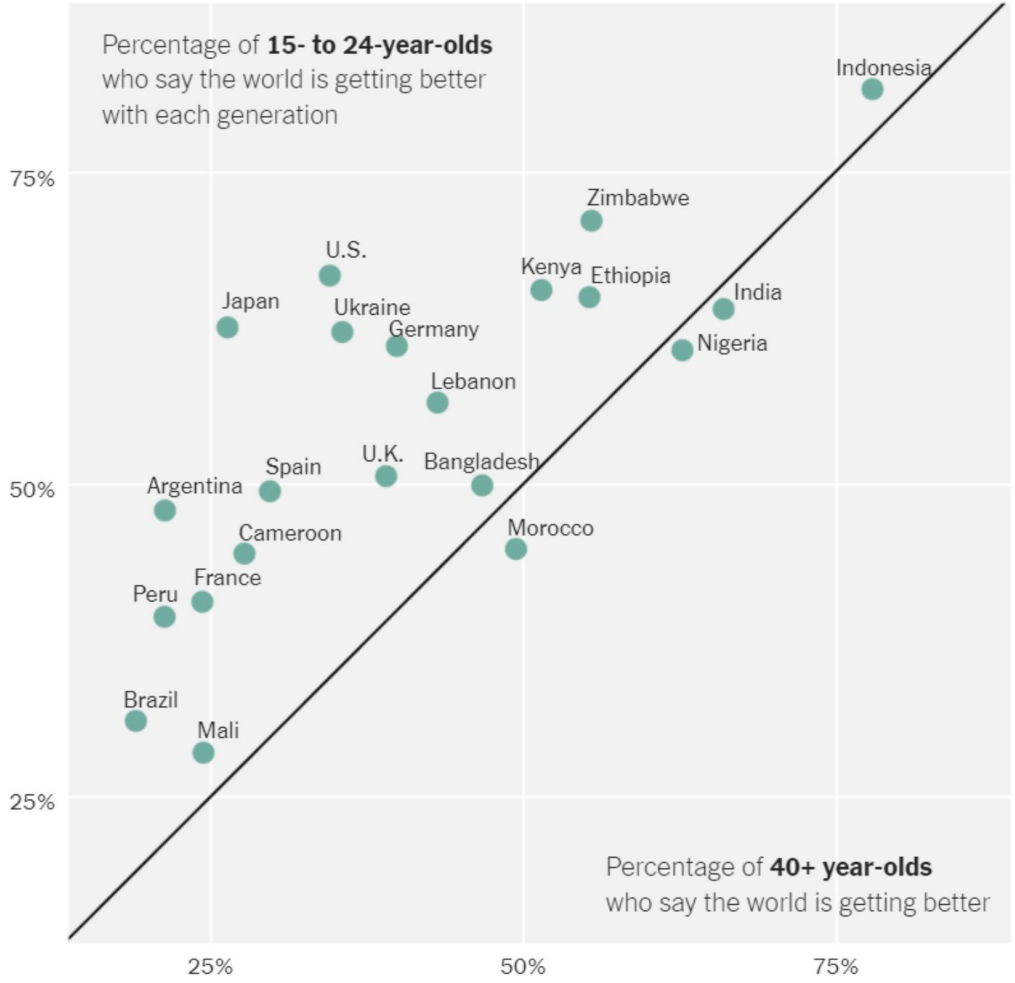
**Do you think the world is becoming a better or worse place with each generation?**

21,000 people were surveyed by telephone in 21 different countries

Survey took place from February to June 2021

The New York Times

https://www.nytimes.com/2022/02/03/learning/whats-going-on-in-this-graph-feb-9-2022.html




Source: UNICEF-Gallup survey of more than 21,000 people conducted by telephone in 21 countries between February and June 2021.

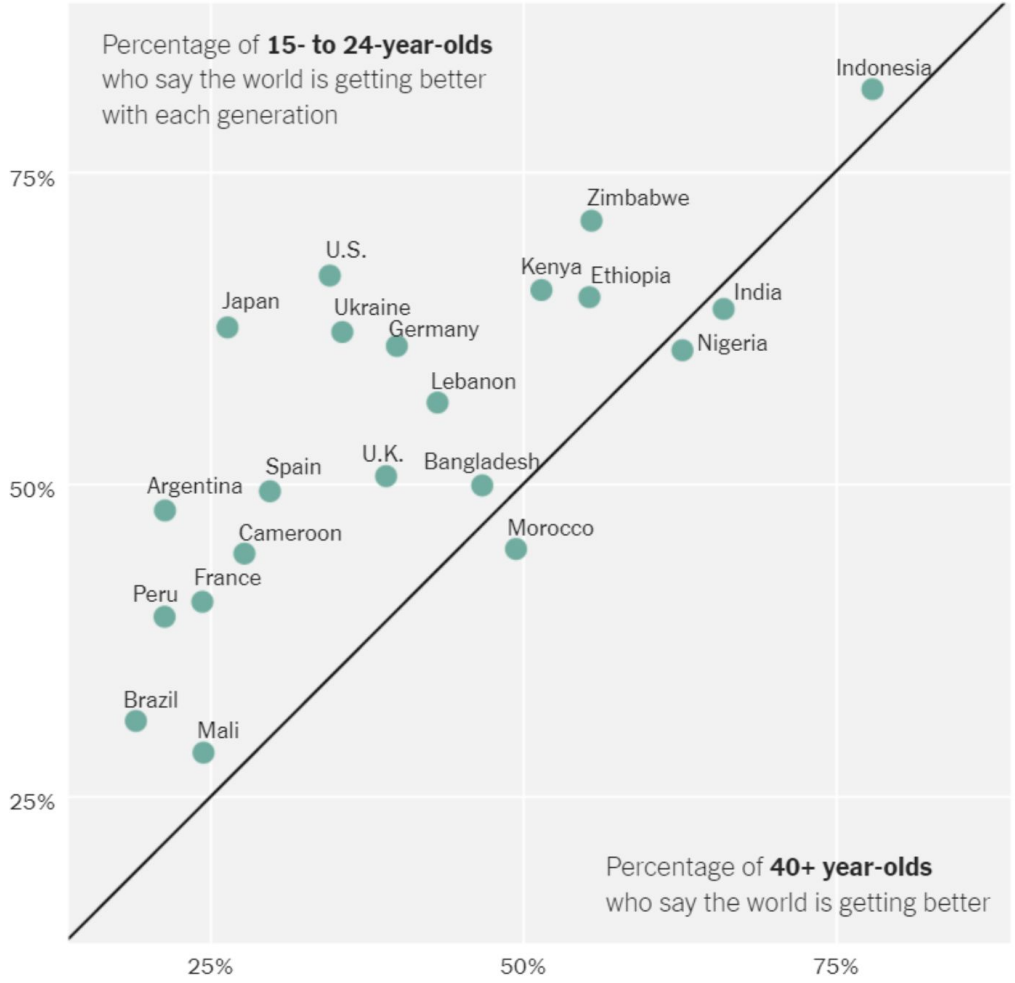
## Breaking down the graph

What does it mean for a country to be above the drawn line? Below the drawn line?

How would you describe responses to the survey from U.S. participants?

The New York Times

https://www.nytimes.com/2022/02/03/learning/whats-going-on-in-this-graph-feb-9-2022.html

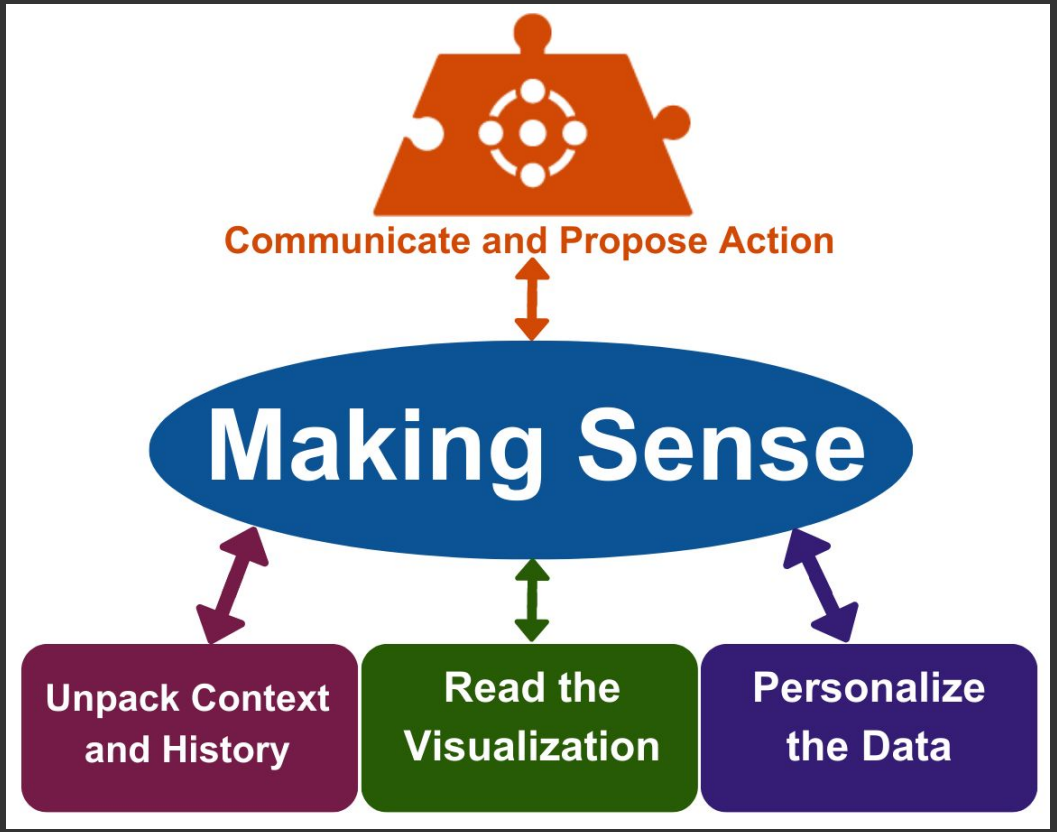



Source: UNICEF-Gallup survey of more than 21,000 people conducted by telephone in 21 countries between February and June 2021.

# Resources for Visualizations

- New York Times “What’s Going on in this Graph”
- Turner’s Graph
- Data Talks for K-12 classes
- Statista collection of Infographics

# Data Visualizations

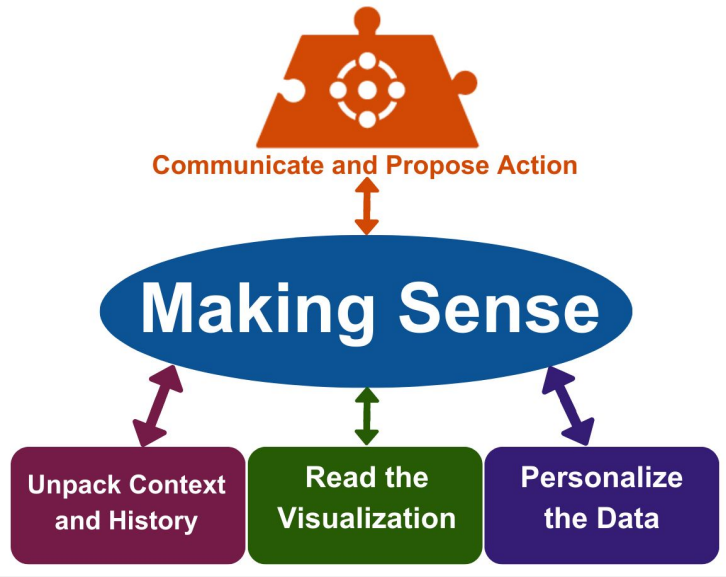



https://bit.ly/MakingSenseofDataVisualizations

# Making Sense of Data Visualization

**With your shoulder buddy, review the discourse prompts and reflect on this framework:**

- Do parts of this framework surprise you?
- Are there parts of this framework you already do well with students?
- What are the challenges to using data visualization in the classroom?

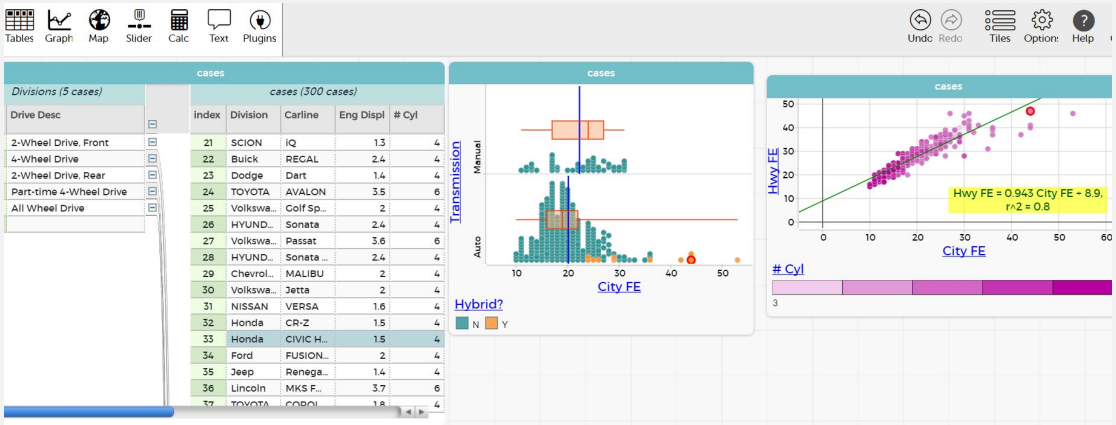


# Discourse and Data Investigations

# Examine Data in Our Favorite Data Tool: CODAP

**Free**
**No login required**
**Easy to use**
**Under continual development**

[codap.concord.org](codap.concord.org)



# Let's Reimagine!

Emily & Adrian 2/5

Keely 9/12

Bruce 5/10

Hollylynne & Sammy & Sam 12/6

Maureen 7/7

Bocephus 9/26

Gemma 1/12

# What is we asked…

- What is the probability that at least 2 people in a room share the same birthday?
- Is every birthday just as likely as any other birthday?
- In the US, are there about the same number of births recorded on every day throughout the year?
- Are birthdays uniformly distributed throughout the year?

# And we obtained data

**Number of live births recorded in U.S. every day from 2000-2014.**

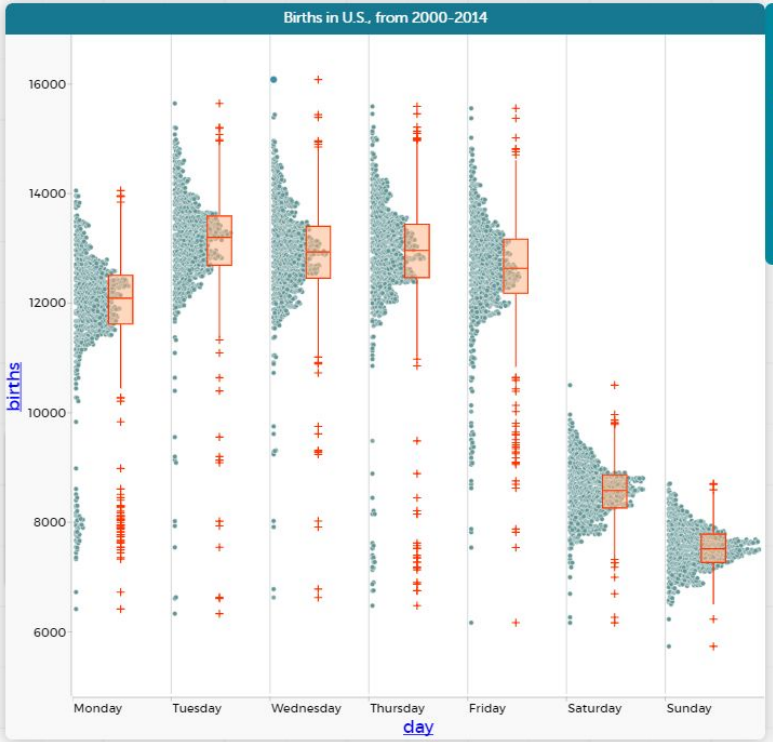
https://bit.ly/Births

# https://bit.ly/Births

Number of U.S. Daily Births: 2000-2014

*U.S. births by date (5479 cases)*

| index | month | date_of_month | day_of_week | day | date_of_birth | births |
|---|---|---|---|---|---|---|
| 250 | 9 | 7 | 1 | Monday | 9/7/2009 | 7947 |
| 251 | 9 | 8 | 2 | Tuesday | 9/8/2009 | 13555 |
| 252 | 9 | 9 | 3 | Wednes... | 9/9/2009 | 16081 |
| 253 | 9 | 10 | 4 | Thursday | 9/10/20... | 14887 |
| 254 | 9 | 11 | 5 | Friday | 9/11/2009 | 13032 |
| 255 | 9 | 12 | 6 | Saturday | 9/12/20... | 9264 |
| 256 | 9 | 13 | 7 | Sunday | 9/13/20... | 7871 |
| 257 | 9 | 14 | 1 | Monday | 9/14/20... | 13393 |
| 258 | 9 | 15 | 2 | Tuesday | 9/15/20... | 14558 |
| 259 | 9 | 16 | 3 | Wednes... | 9/16/20... | 14130 |
| 260 | 9 | 17 | 4 | Thursday | 9/17/20... | 14095 |
| 261 | 9 | 18 | 5 | Friday | 9/18/20... | 13951 |
| 262 | 9 | 19 | 6 | Saturday | 9/19/20... | 9032 |
| 263 | 9 | 20 | 7 | Sunday | 9/20/20... | 8014 |
| 264 | 9 | 21 | 1 | Monday | 9/21/20... | 13415 |
| 265 | 9 | 22 | 2 | Tuesday | 9/22/20... | 14318 |
| 266 | 9 | 23 | 3 | Wednes... | 9/23/20... | 13973 |
| 267 | 9 | 24 | 4 | Thursday | 9/24/20... | 14048 |
| 268 | 9 | 25 | 5 | Friday | 9/25/20... | 13449 |
| 269 | 9 | 26 | 6 | Saturday | 9/26/20... | 9013 |



# Additional Classroom Ready Data Sets!

- Rollercoaster Data Set
- North Carolina Discipline Data
- Cereal Data Set
- US Census at School - Random Sample of 500 Cases

# Online learning opportunities for teachers

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**instepwithdata.org**

InSTEP

# Questions

# Stay Connected

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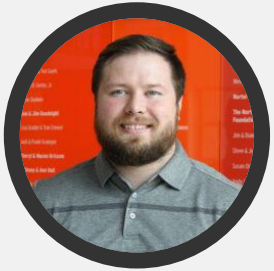

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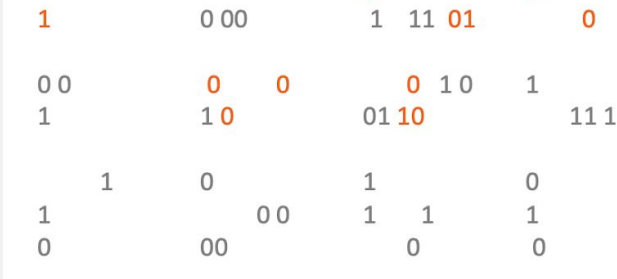
DataScience4 everyone

# Join us for a Community Meet up!

Friday 5-7pm, Food and Drinks Provided
Calico , 50 Blagden Alley NW,
Washington, DC 20001

Use QR code to RSVP now!



Community Meetup Registration

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