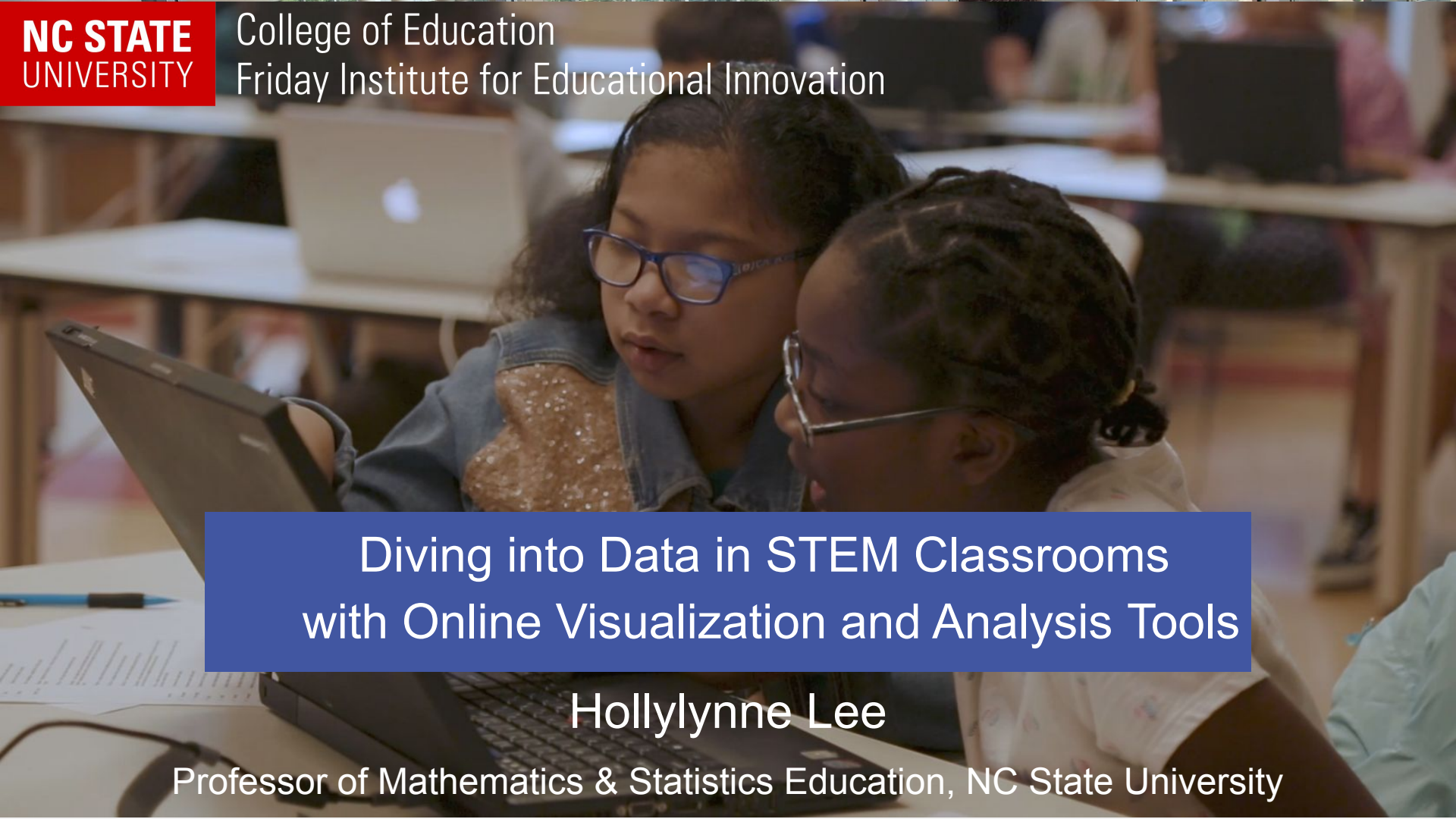


NC STATE UNIVERSITY

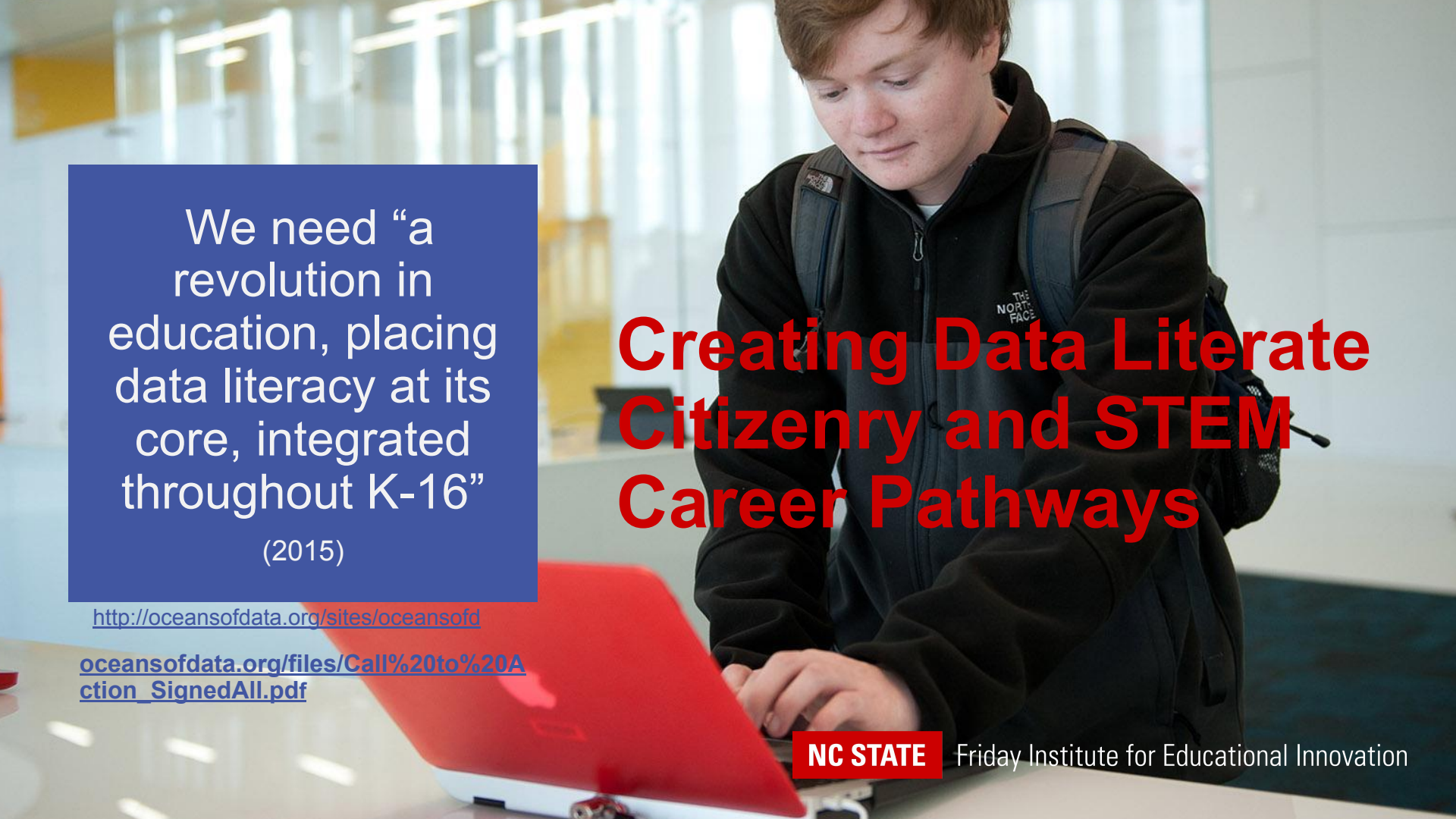
College of Education
Friday Institute for Educational Innovation

Diving into Data in STEM Classrooms with Online Visualization and Analysis Tools

Hollylynne Lee

Professor of Mathematics & Statistics Education, NC State University

NC STATE Friday Institute for Educational Innovation



We need “a revolution in education, placing data literacy at its core, integrated throughout K-16”

(2015)

http://oceansofdata.org/sites/oceansofd

oceansofdata.org/files/Call%20to%20Action_SignedAll.pdf

Creating Data Literate Citizenry and STEM Career Pathways

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Think of a time you used data to learn something or make a decision. What was the phenomena or situation?

Menti.com

Code 28 98 08

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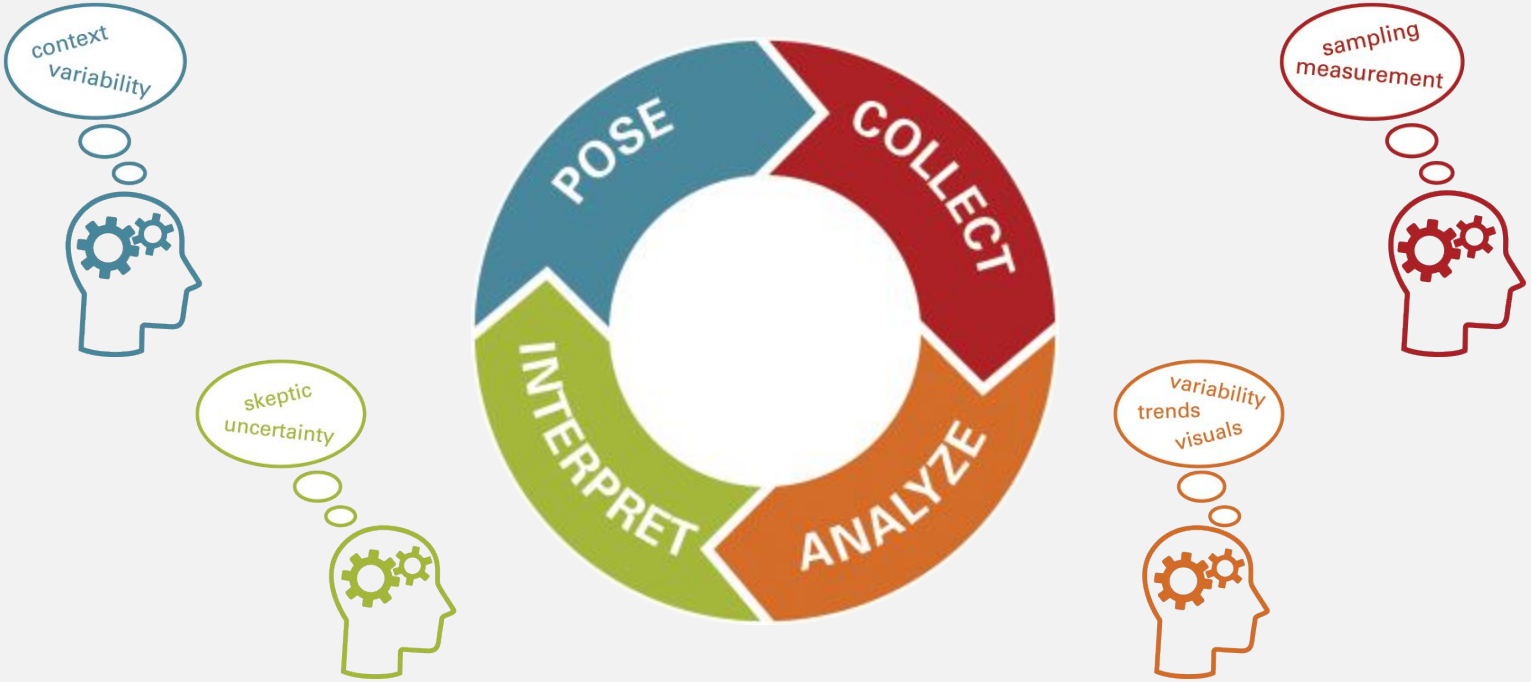
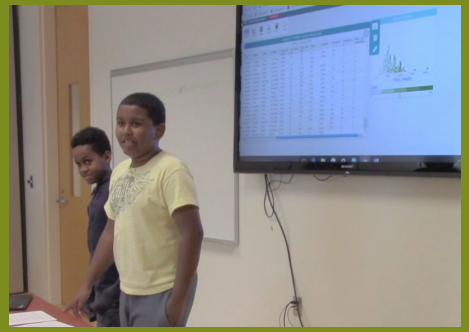
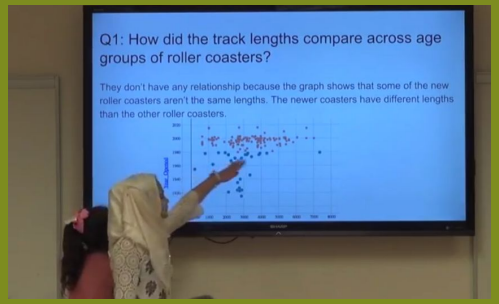
Thinking in Data Investigations



Learners as Data Investigators



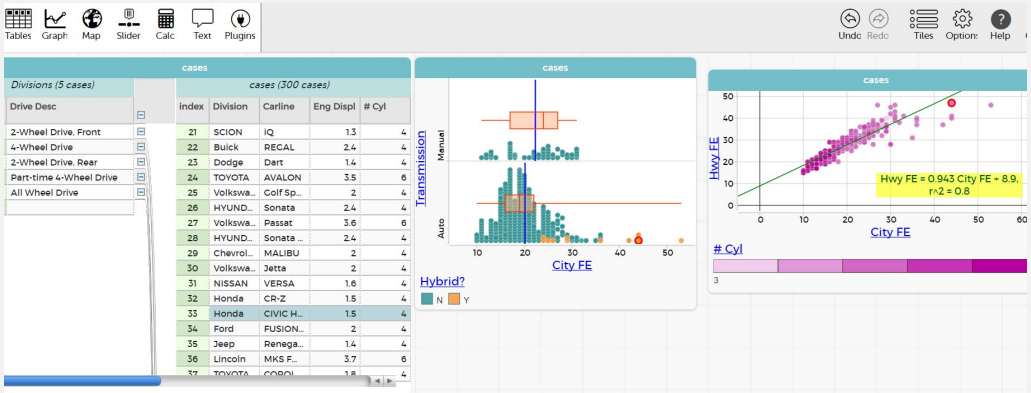


codap.concord.org

Free

No login required

Easy to use



Works best in Chrome or FireFox

Optimal on computer or chromebook or large tablet

NOT optimal on iPads or phones

Recipe for Sparking Curiosity

- Data is real (collected by students or authenticated by teacher),
- Data is multivariate (categorical & quantitative),
- Data is “big”, and sometimes messy
- Data is from contexts engaging to students
- Tools facilitate data moves, in tabular and graphical form
- Tools support links among representations of data
- Tasks have multiple entry points for different levels of sophistication
- Tasks provoke curiosity and promote different ways of engaging with data

Roller coasters

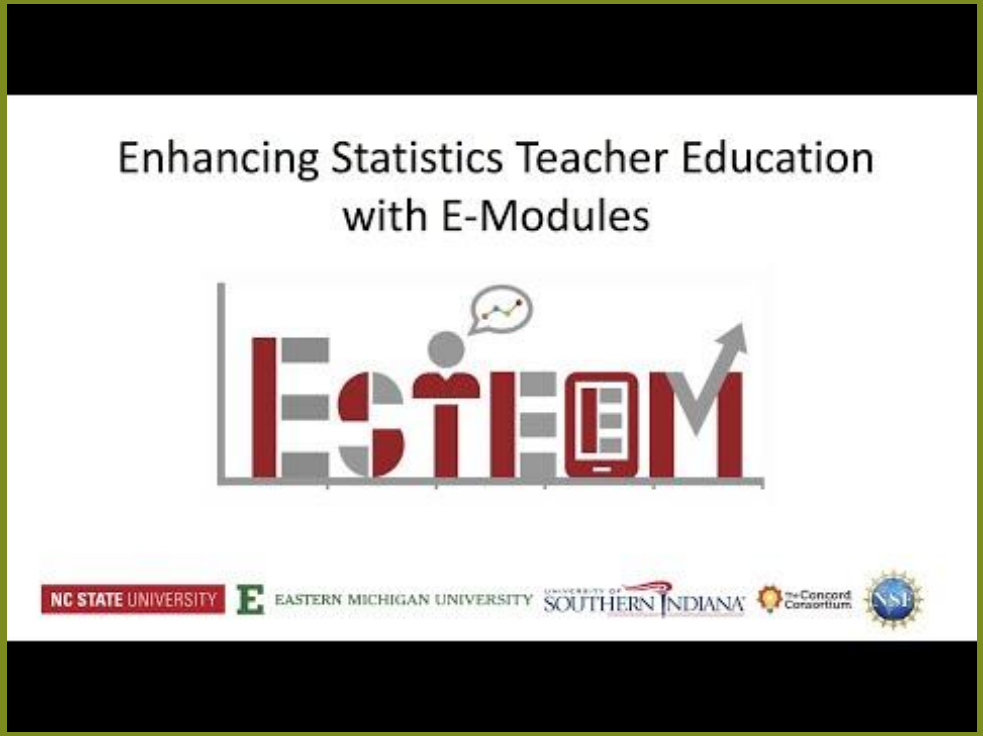
The Launch...

Get them engaged in the context of the data so they start to think about how different attributes (variables) may vary and begin to formulate questions.

Data investigations can connect with students' everyday experiences and understandings and allow them to bring those to their STEM learning experience.

Create a shared experience!

Launching a Roller Coaster Investigation



Let's Examine Data
31 Older Roller Coasters

tinyurl.com/31coasters

How tall do older coasters tend to be?

Open Bigger Roller Coaster Dataset

codap.concord.org

Click on **Try Codap** (upper right)

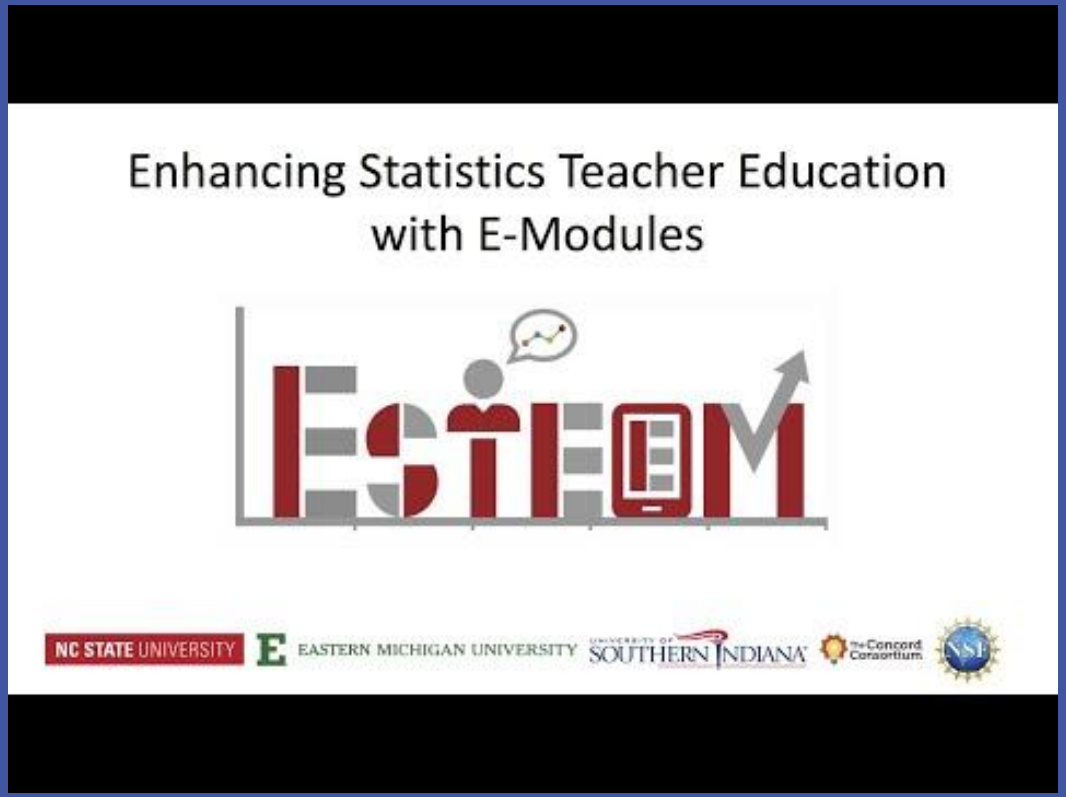
Choose “Open Document or Browse Examples”

Choose Roller Coasters

Questions to Consider

- What do you notice about the top speed of these coasters? What factors may be related to the speed of a coaster? Does the age of the coaster matter?
- Do wooden coasters tend to have the same height as coasters made from steel? How do the wooden and steel coasters differ with other variables? Does anything surprise you?
- Are roller coasters that have inversions taller than roller coasters without inversions? Why or why not?

7th Grade Students



What STEM content could be taught through understanding roller coasters?

Nutrition, Diabetes, and Breakfast Foods

How do you “break the fast”?

Two Possible Data Sets

77 common cereals and their nutritional values

tinyurl.com/commoncereals

33 common granola bars, nutritional values and characteristics

tinyurl.com/33granolabars

Personalizing the Cereal Data Set

Consider some cereals nutrionists have said were healthy in a sample recent media report. Would middle school age kids eat these cereals?

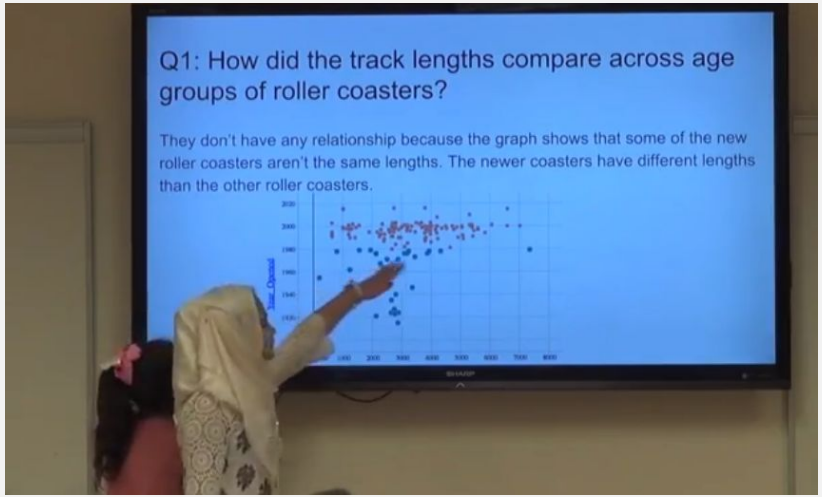
We could add an attribute in the dataset of Kids Eat: Yes No Maybe

Are any of these cereals considered high in potassium? (nutritionist tend to mark high levels as >=200 mg)

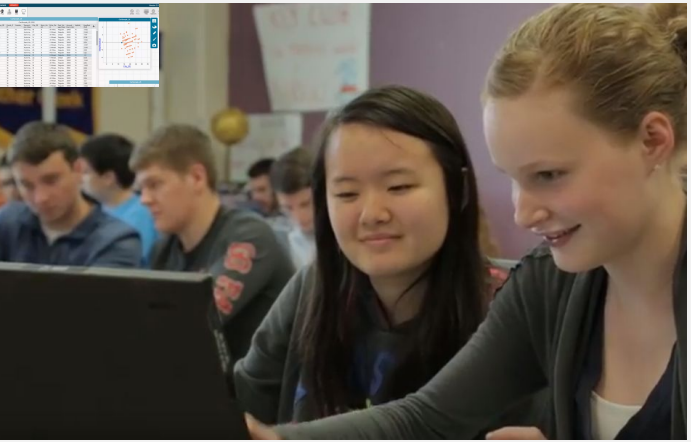
We could add an attribute and compute whether a cereal is Low or High in potassium.

What STEM content could YOUR STUDENTS learn with a data investigation?

Big(ger) Data in Schools



Use of visualization tools that link representations and facilitate data moves and simple coding



Engage with real contexts and integrate STEM

Tips for Using CODAP

1. Watch a brief video introduction to commonly used features of CODAP (transcript);
2. Engage with two brief Getting Started Tutorials to learn about basic ways to interact with data in CODAP:

   Getting Started in CODAP, Part 1 Getting Started in CODAP, Part 2

3. Check out CODAP's For Educators page that highlights resources for educators.

Resources for Teaching Data Literacy

https://www.nytimes.com/column/whats-going-on-in-this-graph

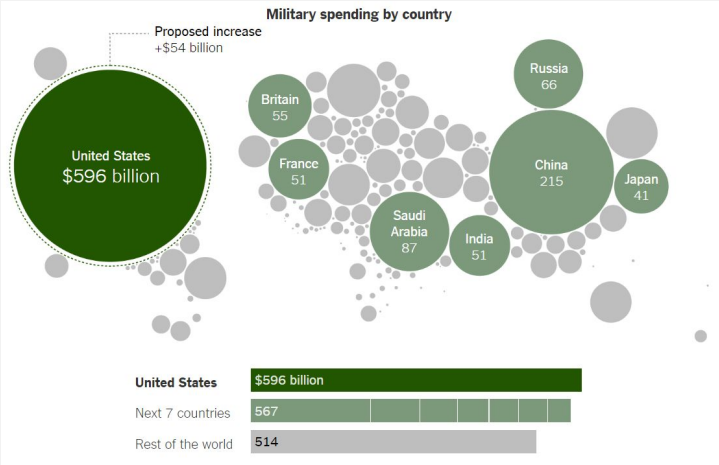
Week of Feb 13: This graph shows the relative size of military budgets by country in 2015. It originally appeared elsewhere on NYTimes.com.
After looking closely at the graph above, think about these three questions:

- **What do you notice?**
- **What do you wonder?**

What are you curious about that comes from what you notice in the graph?

- **What might be going on in this graph?**

Write a catchy headline that captures the graph's main idea. If your headline makes a claim, tell us what you noticed that supports your claim.



WHy use this in STEM classrooms?
https://www.nytimes.com/2018/08/27/learning/whats-going-on-in-this-graph-is-now-weekly-stem-teachers-explain-why-its-a-powerful-activity.html

http://statisticsteacher.org

STATISTICS TEACHER
SUPPORTING THE TEACHING AND LEARNING OF STATISTICS

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STEM Roadmap Curriculum Modules

www.nsta.org/publications/press/stemroadmap.aspx

hollylynne@ncsu.edu

HI-RiSE: A Hub for Innovation and Research in Statistics Education

hirise.fi.ncsu.edu

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