

# **STELAR ITEST PI & Evaluator Summit**

## **Strand 4, Session 2: Best Practices and Tools for *Engaging K-12 Students in Big Data;***

**Friday June, 16; 10:00-11:45AM**

# Agenda:

- 10:00-Recap Session 1
- 10:05- Guiding Questions and Assumptions
- 10:20- Learning From Our Own Research
- 11:00- Citizen Science Platforms
- 11:20- Youth Radio: Telling Stories with Data
- 11:30- Wrap-up and Take Stock

# Guiding Questions, Assumptions, Themes

- What is meant by big data?
- How do people (adults and children) interact with big data in their everyday lives? Knowingly and unknowingly?
- What constitutes data literacy? What are the core competencies required to successfully interact with (big) data? What does success look like for K-12 students?
- Goal: SWBAT see the patterns and tell a story about the patterns
- What is meant by *authentic* data?
- What generates motivation in people to tackle big data (adults vs children)? Why take the time and effort to deal with something so large and messy? Academic versus economic motivation....
- What kinds of tools help to clean up the mess, see the pattern, then tell story about the pattern (data management, analysis, and visualization)?
- What do ITEST projects tell us about best practices? What do other projects tell us? What are the gaps?

## 2017 ITEST Summit: Solutions for Engaging Students in Big Data (Responses) - Sheet2

Researcher	Project	Description	How?	Best Practices?
Stephen Koury	The Western New York Genetics in Research Partnership: Expanding Exposure, Career Exploration and Interactive Projects in Basic Genome Analysis and Bioinformatics	Our project introduces 9-12 students and teachers to the use of bioinformatics tools for analysis of genomic data	Students and teachers <b>learn to query databases</b> of genomics data to find similarity to a unique gene under study	We provided the foundation of tools for allow teachers and students to engage in the data analyses in terms of an easy accessible and free online toolkit called GENI-ACT, personalized instruction in the use of the tools contained in GENI-ACT and a detailed project manual. We have found that allowing teachers to take part in a second year in the project to develop their own course or curriculum using the toolkit has resulted in teachers developing and sharing their own resources based on their first year of participation and their goals for using the material in their courses.
Catherine Cramer	Big Data for Little Kids: Data Modeling with Young Learners and their Families	In an informal education setting, we are creating, testing and refining a curriculum that invites children ages 5-8 and their caregivers to engage in playful, hands-on, collaborative exploration of foundational concepts of data modeling, which will generate preliminary evidence on the impact of participation as these families from underserved communities engage in sustained and data-rich inquiries into questions that matter to them.	<b>Children ages 5-8</b> are participating in a 6-week workshop series, along with their adult caregivers, in which they will <b>collect, analyze and visualize data gathered from around the museum</b> , with a goal of raising their data fluency and literacy.	From previous work, we have found the following software to be accessible to high school aged students: Python, Gephi, R, Ora, and NetLogo. Our current project is based on research on big data modeling, and in particular the research by Schauble+Lehrer. As our project is based on Research and Development in an informal setting, and our workshops are just getting under way, we can only mention what we will be looking at: Early childhood education (5-8 years old) Parental engagement Family engagement Context in which data are personally meaningful Data gathered through hands-on experiences Understanding through visualization
Michael Johnson	Collaborative Research: Connected STEM - Promoting STEM Education Through Connected Devices and Building Automation	Promote engineering awareness and interest through building automation, IoT, and 3D printing.	<b>Sensors</b> will be used to collect data about building and environmental conditions; this data will be analyzed as part of the project.	We hope to use relevant and authentic data to promote interest and help emphasize concepts.
Jim Hammerman	I'm the evaluator on two ITEST projects: Maine LearnToMod: Creating a Virtual Infrastructure for Engaging Rural Youth in STEM Disciplines through Computer Science; and AIM-ED (All Included in Math): An impact study to examine the efficacy of a mathematics professional development program for elementary teachers	The Maine Learn to Mod program engages middle school students in learning to code by "modding" in MineCraft. AIM-ED provides PD supports for elementary math teachers around creating supportive discourse communities, and is studying the impact on teaching and student achievement. I'm also a Co-PI on a STEM+C project that's more closely aligned with the (big) data literacy theme, with high school students (sighted and visually impaired) working together with researcher/ developers to design software so that blind and visually impaired students can engage in astronomy data collection and analysis. Data structures and data manipulation are important components of this work. I've been the evaluator on a DRK12 project (LOCUS) developing assessments of statistical ideas and professional development supports for teachers.		I've had a long-standing interest in data and statistics education and led a small research project several years ago about how some statistical ideas could be <b>better learned by first engaging with large scientific data sets</b> . A key idea there was the notion of "shrinking a sample" -- that notions of statistical significance and sampling could be explored starting with large data sets where any detectable difference is significant and then systematically reducing the sample to explore changes in confidence. Generally, I think too often <b>basic data literacy gets lost in our excitement about working with "big data"</b> . So the <b>research on how students understand data and statistics</b> -- signal and variability, covariation, sampling and sample size, etc.--are important to consider. There have been several conferences recently about data science and data science education technologies that should be of interest to this community. A few specific resources: • Common Online Data Analysis Platform (CODAP) from Concord Consortium, and related software TinkerPlots. • Oceans of Data project at EDC • Levels of Conceptual Understanding of Statistics (LOCUS) assessment and PD supports (U Florida) • NetLogo modelling software (Northwestern) • The Statistical Reasoning, Thinking and Literacy (SRTL) international community • There are several Big Data Hubs across the US that have some interest in K-12 education.
Yang (Paul) Xu	Node-Pi: An Affordable Cloud-based IoT System	We explore the use of a <b>\$4 Wi-Fi and Python enabled micro-controller</b> to introduce students to the concepts of Python programming and cloud computing with Internet of Things	Our project engages K-12 students in the use of big data through exposing them to ubiquitous computing using the Internet of Things and cloud computing with <b>IBM Watson IoT platform</b> , while using the beginner-friendly Python language.	
Michael Stanley Gallisdorfer	Geotechnology Experiences for Students and Teachers	Integrating Geographical Information Systems and Science , and geotechnologies, with middle- and high-school STEM curricula.	Students learn to identify, acquire, organize, visualize, analyze and present geospatial data, using Web-based GIS and mobile GIS apps.	ArcGIS Online, facilitated peer-to-peer learning, hands-on, inquiry-based learning.
Alex M. Gurn	From Data to Awesome (D2A)	Youth Radio's From Data to Awesome (D2A) project aims to develop and test a design-based collaborative strategy to engage young people to learn, create, and teach using multi-modal data in the production of interactive media for local and national audiences.	Youth participants are introduced to data sciences and data-informed practices in the context of designing, producing, and publishing journalistic media that addresses issues and problems affecting diverse youth communities.	External evaluation research by Rockman et al has documented and analyzed informal STEM pedagogy at Youth Radio for over a decade. Most recent final reports available at: - <a href="https://rockman.com/whats-new/2017/05/stem-media-matters-examining-youth-radio-stem-powered-media-production/">https://rockman.com/whats-new/2017/05/stem-media-matters-examining-youth-radio-stem-powered-media-production/</a> - <a href="http://www.informalscience.org/youth-radio%E2%80%99s-do-it-initiative-summative-evaluation">http://www.informalscience.org/youth-radio%E2%80%99s-do-it-initiative-summative-evaluation</a>  Teach Youth Radio ( <a href="https://youthradio.org/for-teachers/">https://youthradio.org/for-teachers/</a> ) is a website designed for educators to implement digital media projects with youth in a range of settings. DIY educator toolkits include: Telling Stories With Data; How To Make An Infographic; Mobile App Ideation; using App Inventor, and others.  Lee, C. H., & Soep, E. (2016). <b>None But Ourselves Can Free Our Minds: Critical Computational Literacy as a Pedagogy of Resistance. Equity &amp; Excellence in Education</b> , 49(4), 480-492. This article discusses Youth Radio's approach to teaching critical computational literacy (CCL) that combines the strengths of critical literacy and computational thinking.
Pasha Antonenko	iDigFossils: Engaging K-12 Students in Integrated STEM via 3D Digitization, Printing and Exploration of Fossils	The goal of this project is to expand and extend our understanding of integrated STEM learning by designing and testing a model for student engagement using 3D scanning and printing, and computational modeling within a highly relevant but unexplored educational pathway to K-12 STEM – paleontology.	<b>K-12 students and contribute to vast libraries of 3D scans of fossils. Examples of such repository include iDigBio (idigbio.org), DigiMorph (digimorph.org) and MorphoSource (morphosource.org).</b>	We are mostly using online repositories of 3D models and 3D scans like the ones I listed above. Most of the resources we use were <b>designed for scientists and we are trying to expand their usage to include K-12 students and teachers.</b>

# Citizen Science Platforms

**THE GLOBE PROGRAM**  
Visualization System

Select Language Powered by Google Translate

Measurements Data Counts Share Filters Choose Base Map Sites on Map: 72 Sign

2017-06-15

North Pacific Ocean

United States Mexico France Italy Turkey Kazakhstan Mongolia China South Korea Japan

**School:** Littleton Middle School   
**Site:** Weather Station:ATM-01

Next Site   
1/9

Measurements Data Counts School Info Site Info Photos

**Atmosphere**

Air Temperature Dailies

Solar Noon Temperature Dailies  
 Maximum Daily Temperature  
 Minimum Daily Temperature

Data Date Range: 2004-02-13 to 2017-06-15

Measured At: 2017-06-15 16:44:14  
Solar Measured At: 2017-06-15 11:58:00  
Solar Noon At: 2017-06-15 16:46:00  
Daily Average Temperature: 23.2 °C  
Minimum Daily Temperature: 9.3 °C  
Maximum Daily Temperature: 27.0 °C  
Comments: air temp subday rollup  
Elevation: 48.00 m

60  
40  
20  
0  
-20  
-40

°C

2016-06-15 2016-07-21 2016-08-26 2016-10-01 2016-11-06 2016-12-12 2017-01-17 2017-02-22 2017-03-30 2017-05-05 2017-06-10

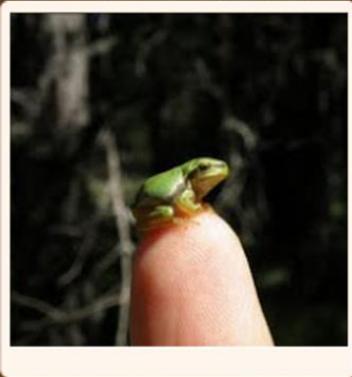
30 Days 1 Year Custom

LEGEND

Map data ©2017 Terra

Scale = 1 : 140M

# <http://www.projectnoah.org/missions/10164691>



Lat: 40.79 Long: -73.97

50 Recent Spottings



Overview



Details



Map

Trending

Popular

Recent

All

Identified

Unidentified

RECENTLY JOINED



# <http://budburst.fieldscope.org/v3/maps/108>


→ Login

Home
Map Data
Graph Data

CREATE MAP PROGRESS:
1 Select Base Map
2 Select Observation Data
3 Set Data Display
4 Select Map Layers
5 View Map

Map

Table

Map Layers

Filters

Data Query Tool

Comparison Tool

Draw Tools

Title & Description

Refresh Data

Download Data

Analyze Data



**Data Summary**

Stations: 2

Observations: 3

Show In Table

**Plants of Summer 2013 and Land Cover**

Use this map as a way to explore common "themes" that emerge in the accompanying data table.

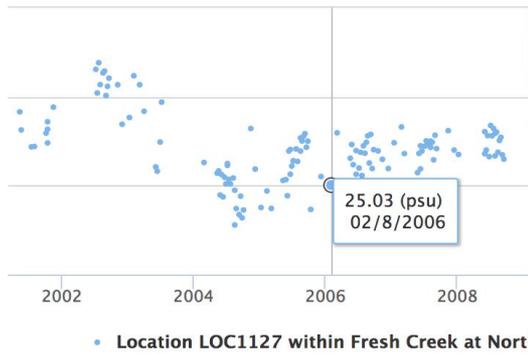
What types of plants were observed in summer 2013? Dig into the data table and note the phenophase recorded for each observation. Does the phenophase match what you would expect? Do you see a certain pattern?

Also use this map to explore land cover and to make interesting connections to other data fields. For example, would you expect there to be more or less plant observations in developed areas? A fun and unexpectedly rich field to explore in the data is station name - what are some common station names you see (hint: backyard)? Plants are everywhere, not just in undeveloped places!

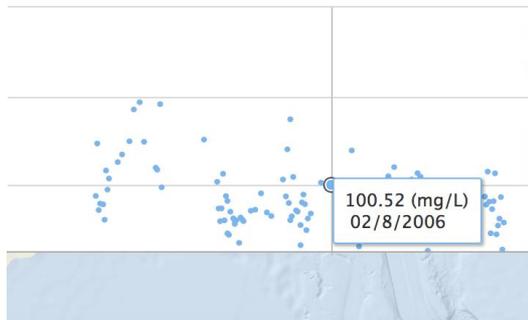
Station Name	Data Source	Observatio...	Phenophase	Common Name	Sci		
acreage6	BudBurst	2013-07-22	First Flower Stalk	Big bluestem	And		
acreage6	BudBurst	2013-07-21	First Flower Stalk	Switchgrass	Pan		
acreage4	BudBurst	2013-06-22	First Flower	Common snowberry	Sym		
Leland-Somonauk Railroad Prairie	BudBurst	2013-06-25	Flowers (Early)	compass plant	Silp		
Rocky Mountain National Park, just N of Deer...	BudBurst	2013-06-23	Flowers (Middle)	White locoweed	Oxytropis sericea	Wildflowers and Herbs	Flowering
Rocky Mountain National Park	BudBurst	2013-06-23	Flowers (Middle)	golden banner	thermopsis montana	Deciduous Trees and Shrubs	Flowering
Beachball CuriOdyssey	BudBurst	2013-06-21	Flowers (Middle)	White clover	Trifolium repens	Wildflowers and Herbs	Flowering
Back Forty CuriOdyssey	BudBurst	2013-06-21	Flowers (Early)	Annual sunflower	Helianthus annuus	Wildflowers and Herbs	Flowering

# <http://www.ciesin.columbia.edu/jbwq/>

Salinity (B) vs Time



Dissolved Oxygen Saturation (B) vs Time



## Jamaica Bay Water Quality Data Visualization and Access Tool

[About](#) [Documentation](#) [Partners](#) [Contact Us](#) [Help](#)

**Choose Data Layer**

- Sampling Locations
- Grouped Locations

**Overlays**

- Grouping Boundary
- Forthcoming Locations

**Choose Base Map**

- ArcGIS Ocean Bathymetry
- OpenStreetMap

Number of measurements: 2

### JBWQ Point Data Explorer

Summary | Stats | Charts

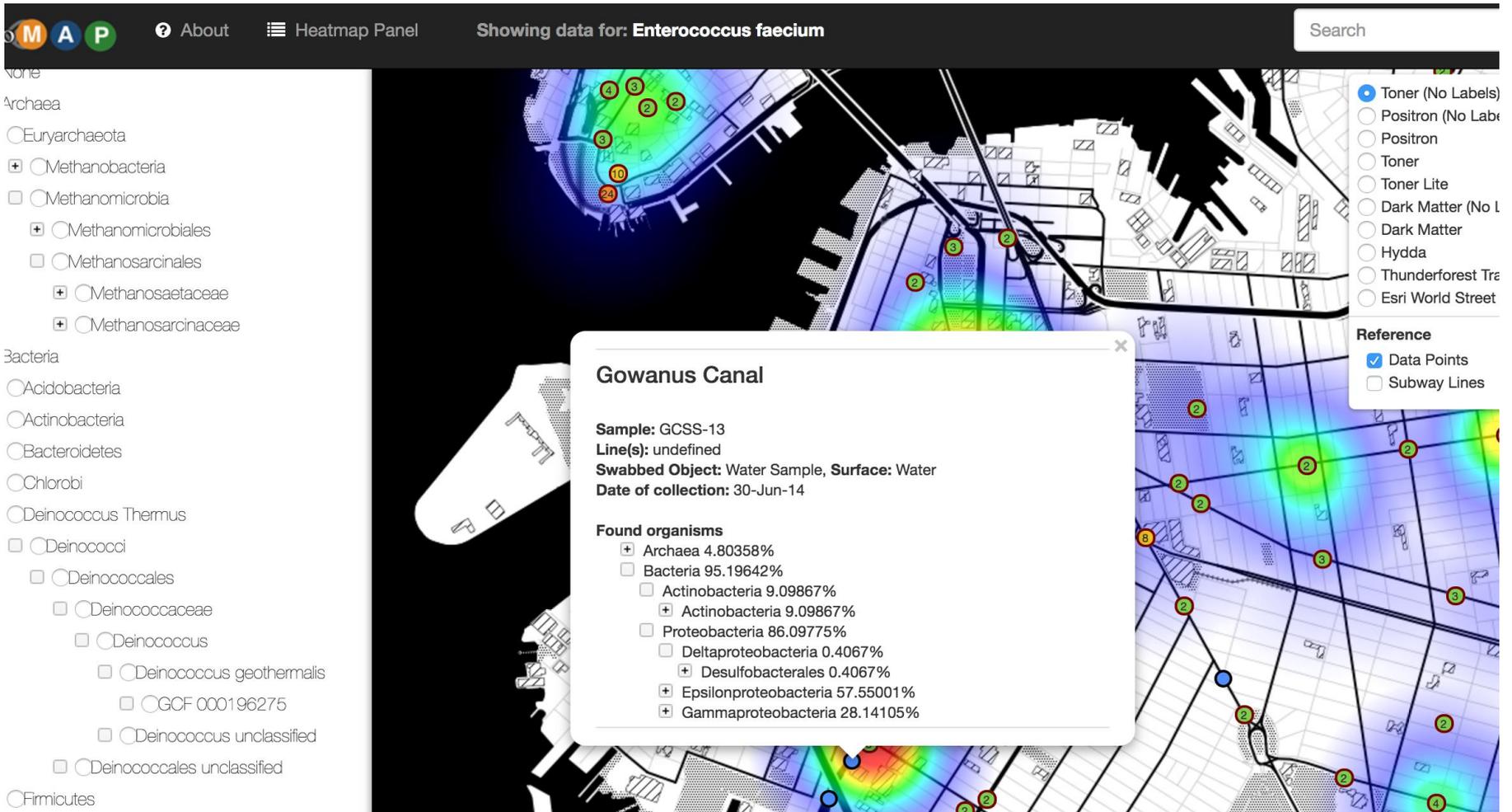
**Create charts:**

Select up to 2 parameters:

Selected Location/Location Group:  
LOC1127,

Choose chart type: Time Series

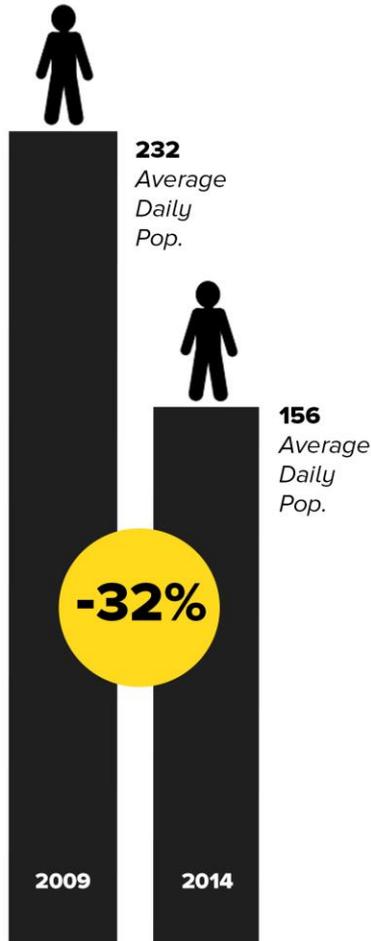
# [http://d2zahwnsqpmout.cloudfront.net/ map/](http://d2zahwnsqpmout.cloudfront.net/map/)



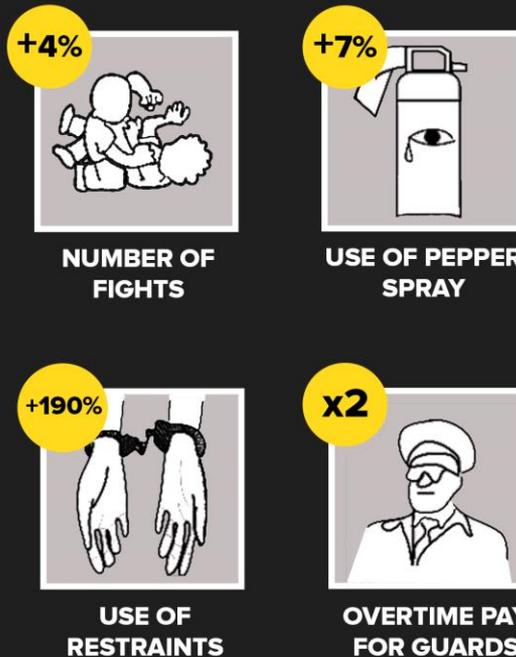
[https://platform.bop.nyc/expeditions/  
data](https://platform.bop.nyc/expeditions/data)

# Examples with high motivation for youth

In recent years, the number of incarcerated kids in Alameda County, CA, has decreased drastically.



But at the same time, conditions in the county's juvenile hall have gotten worse.



<https://youthradio.org/teach-youth-radio/diy-toolkit-telling-stories-with-data/>

- Are Millennials more narcissistic?
- Youth incarceration rates are decreasing but conditions are worsening

What did we learn?