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

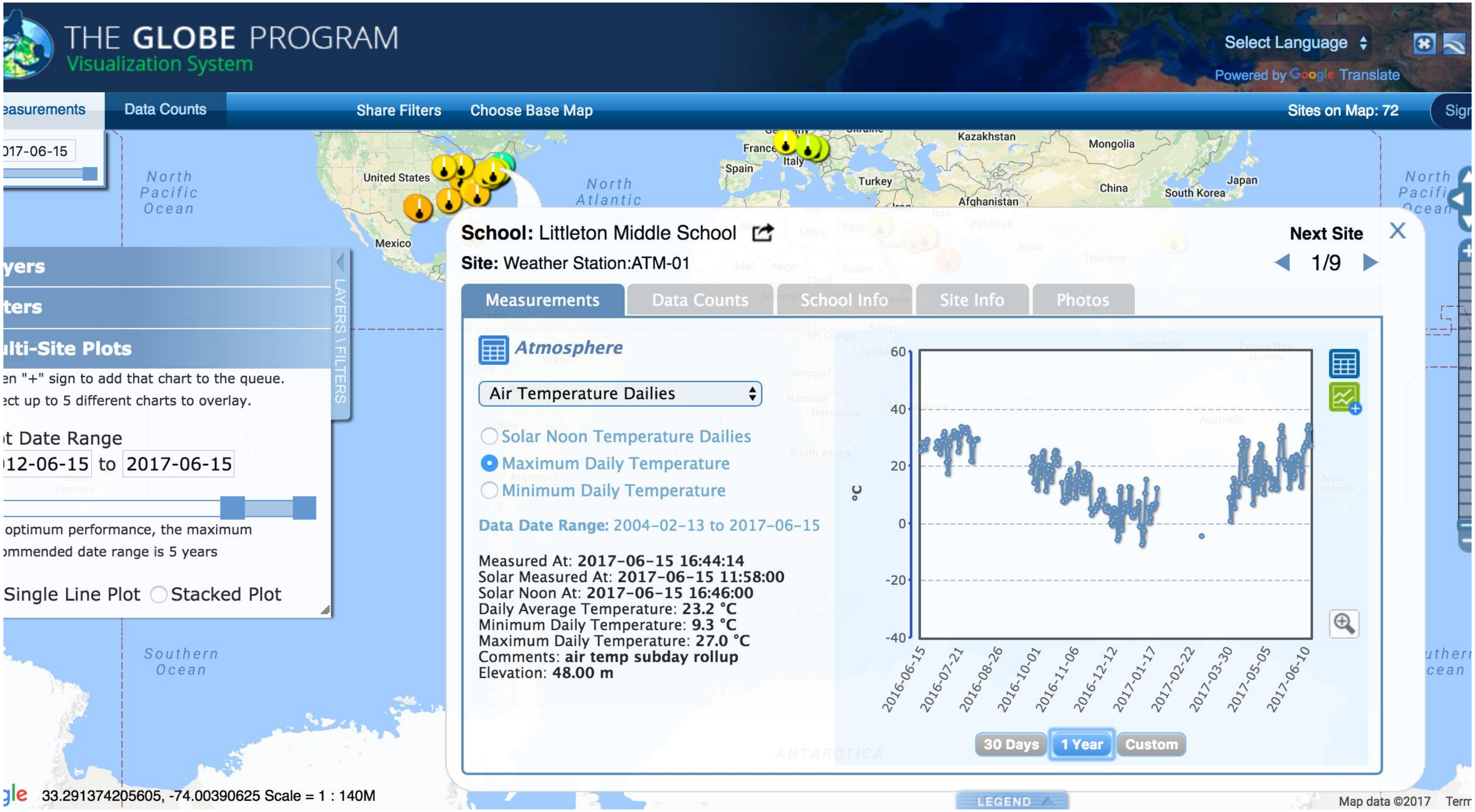
Guiding Questions, Assumptions, Themes

- 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 learn to query databases 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.	Children ages 5-8 are participating in a 6-week workshop series, along with their adult caregivers, in which they will collect, analyze and visualize data gathered from around the museum, 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.	Sensors 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 better learned by first engaging with large scientific data sets. 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 basic data literacy gets lost in our excitement about working with "big data". So the research on how students understand data and statistics -- 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 $4 Wi-Fi and Python enabled micro-controller 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 IBM Watson IoT platform, 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: - https://rockman.com/whats-new/2017/05/stem-media-matters-examining-youth-radios-stem-powered-media-production/ - http://www.informalscience.org/youth-radio%E2%80%99s-do-it-initiative-summative-evaluation Teach Youth Radio (https://youthradio.org/for-teachers/) 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). None But Ourselves Can Free Our Minds: Critical Computational Literacy as a Pedagogy of Resistance. Equity & Excellence in Education, 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.	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).	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 designed for scientists and we are trying to expand their usage to include K-12 students and teachers.

Citizen Science Platforms



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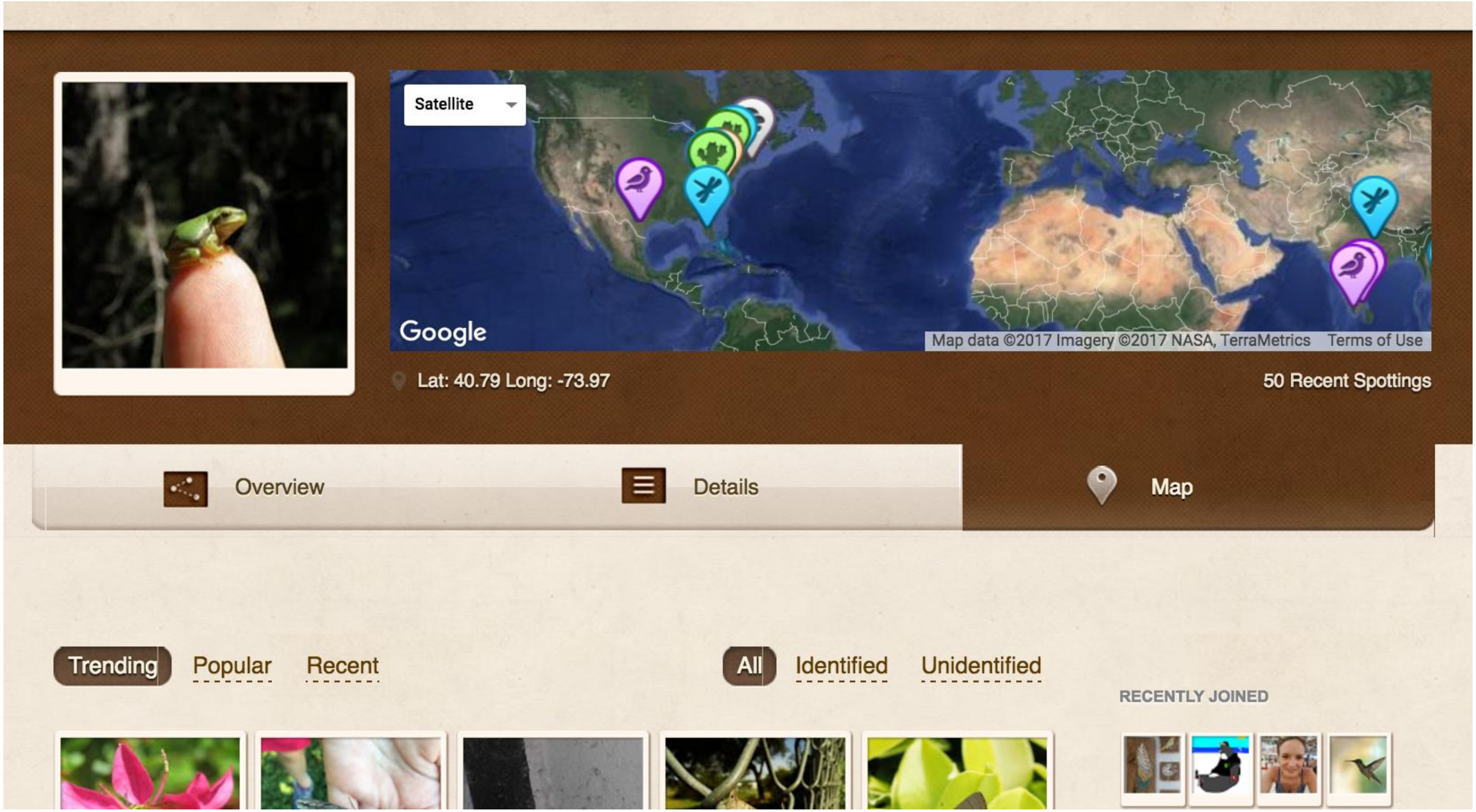

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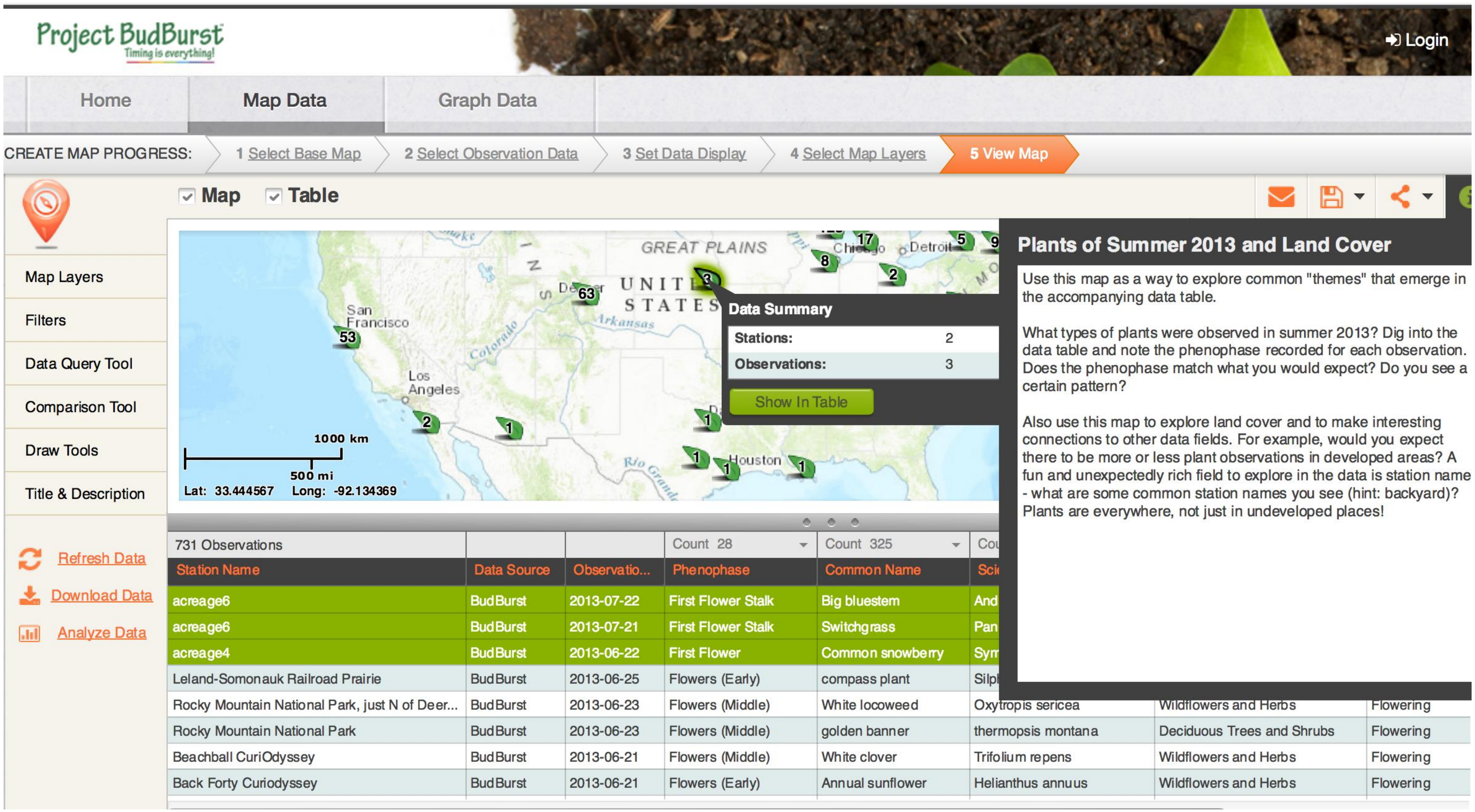

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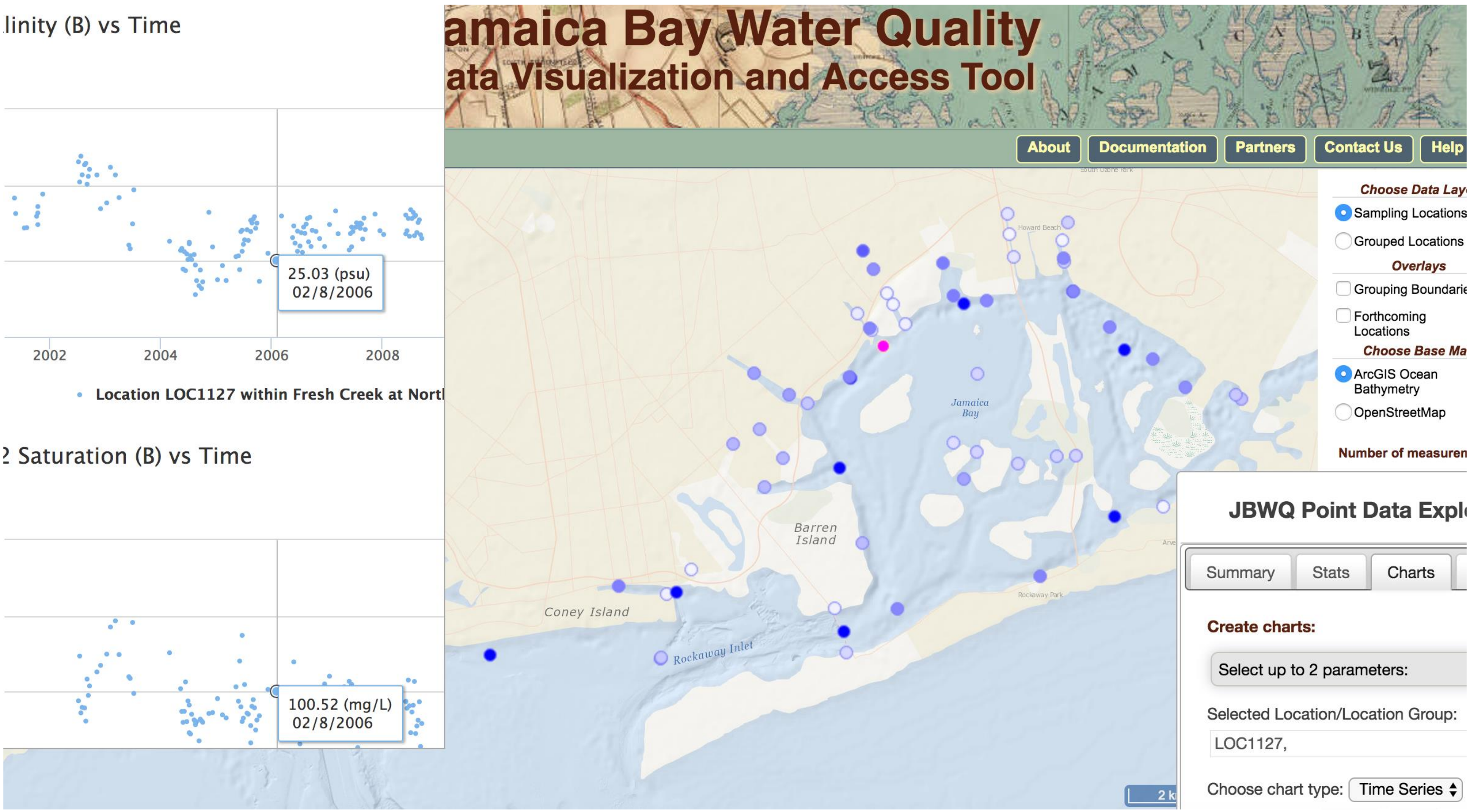

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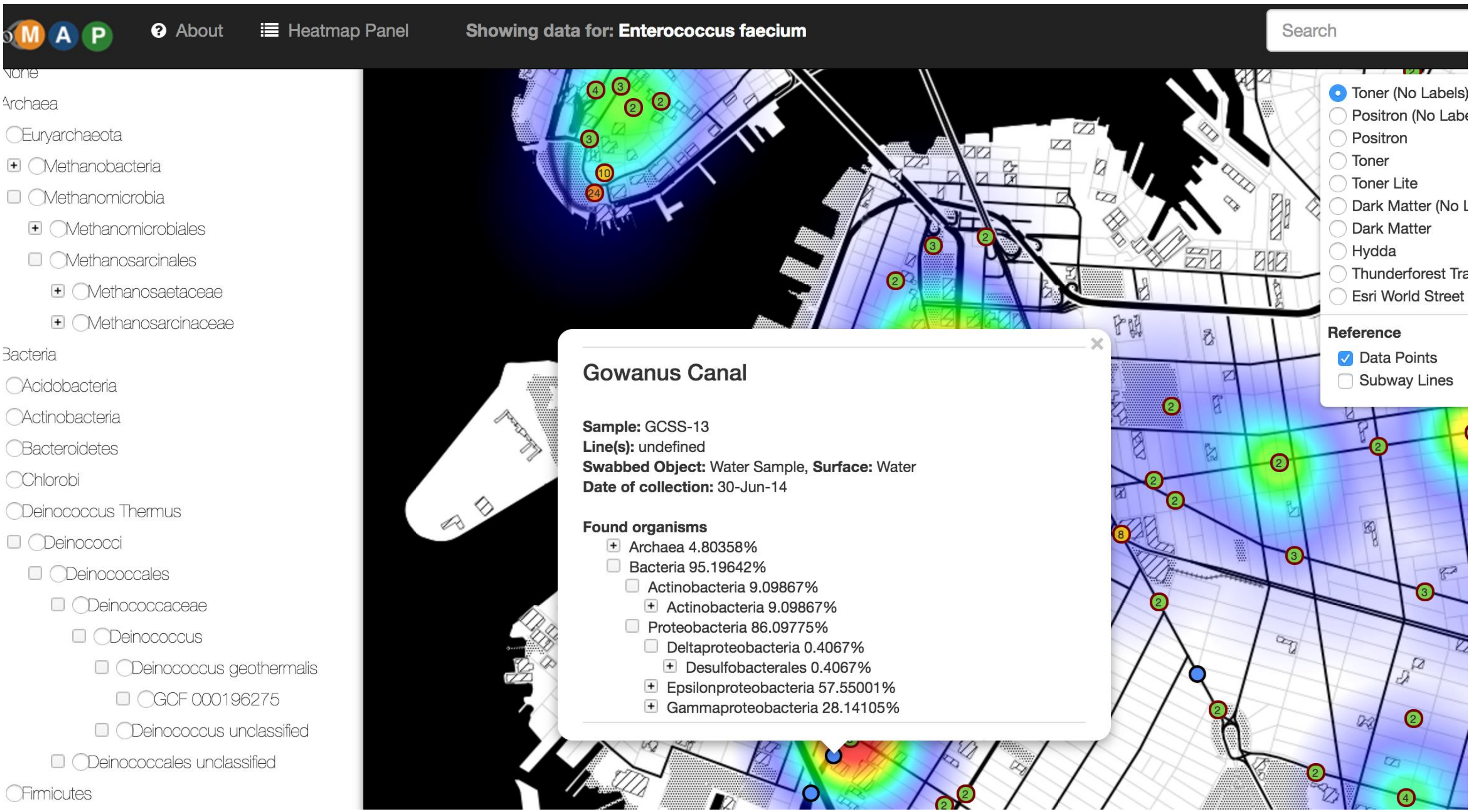
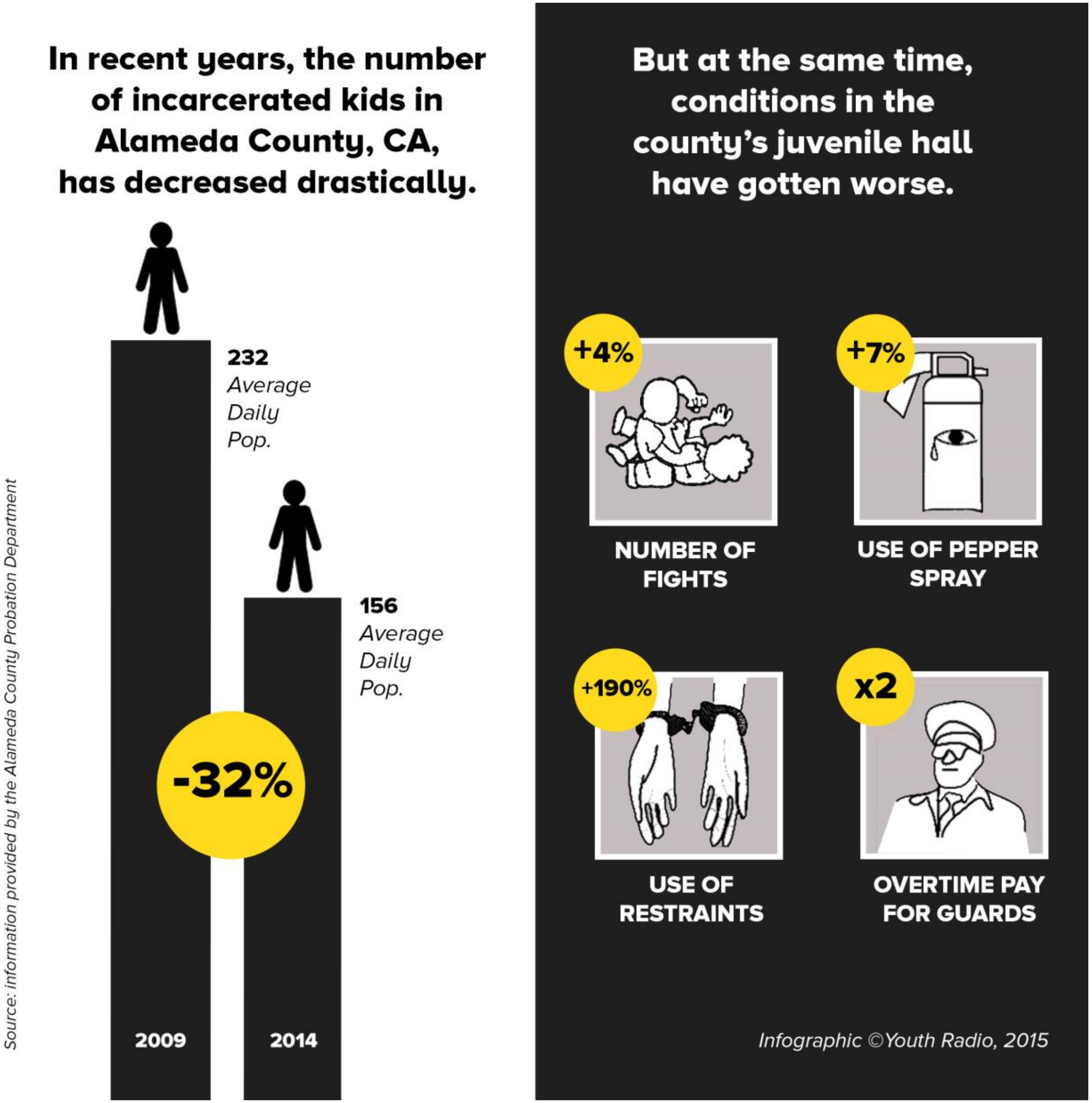


https://platform.bop.nyc/expeditions/data

Examples with high motivation for youth



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?