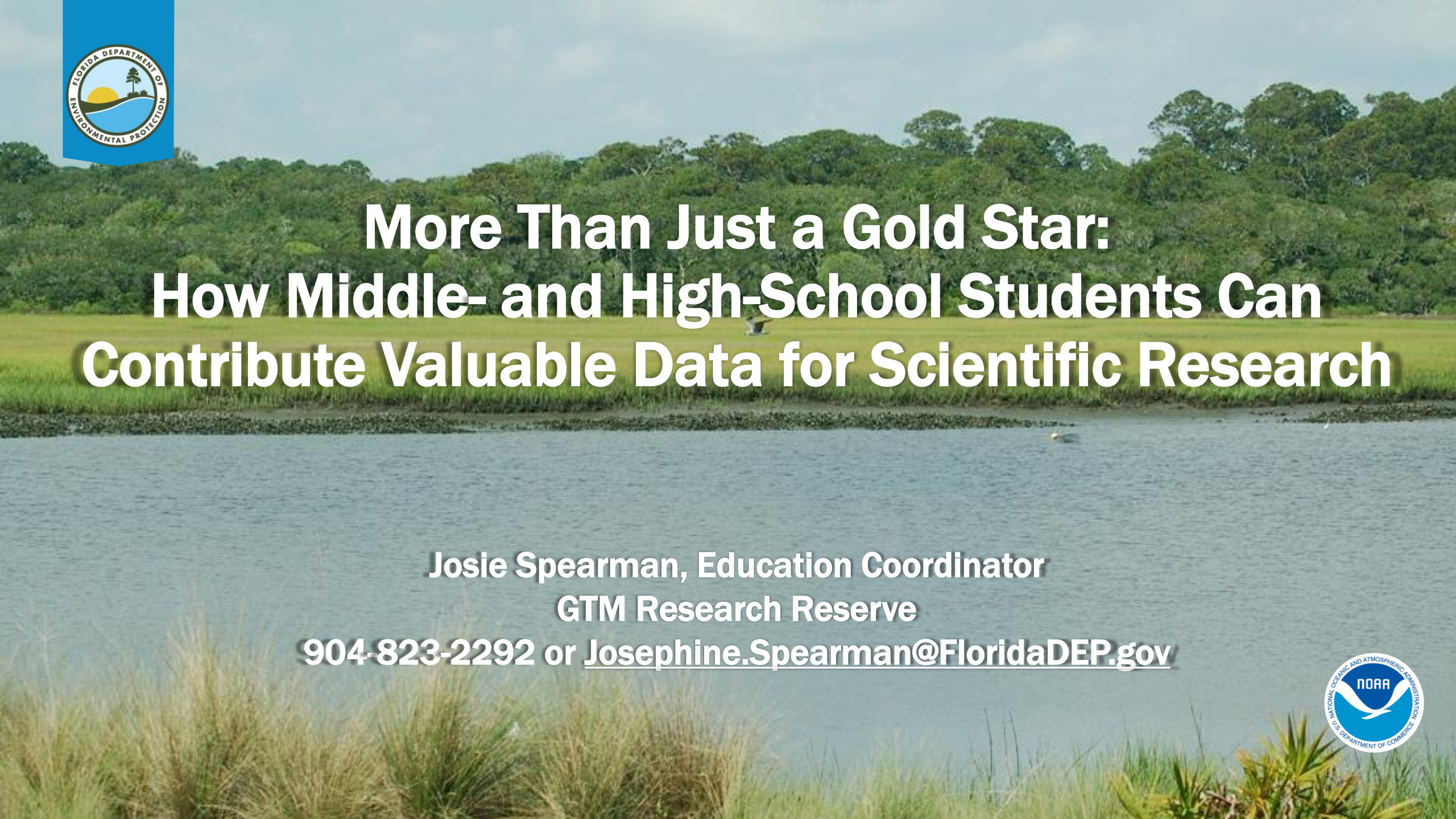

More Than Just a Gold Star: How Middle- and High-School Students Can Contribute Valuable Data for Scientific Research

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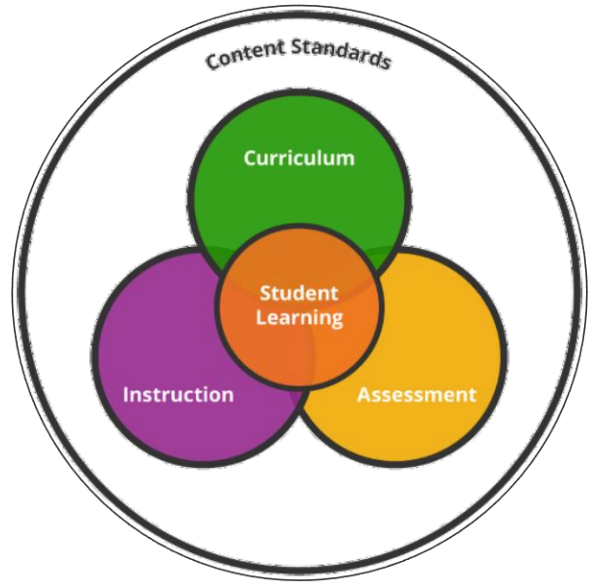
What Makes Field Trips Valuable for Teachers?

✓Learning

✓Purpose

✓Satisfies an Objective



What Makes Field Trips Valuable for Students?

✓ Fun

✓ Activities

✓ New Experiences

✓ Destination

✓ Peers

Living Lab Series Education Programs

What are the programs like?

- Informal environmental education
- Aligned to state standards
- Students replicate what GTM researchers do including collecting data
- Various themes (including biodiversity, plankton, coastal dynamics)

What about the collected data?

- Collected data is stored
- What happens to that data?

Program Mirroring

Research and Citizen Science Projects

- Water Quality and Weather Monitoring
- Guana Dam Seining Survey (biodiversity monitoring)
- Plankton Monitoring

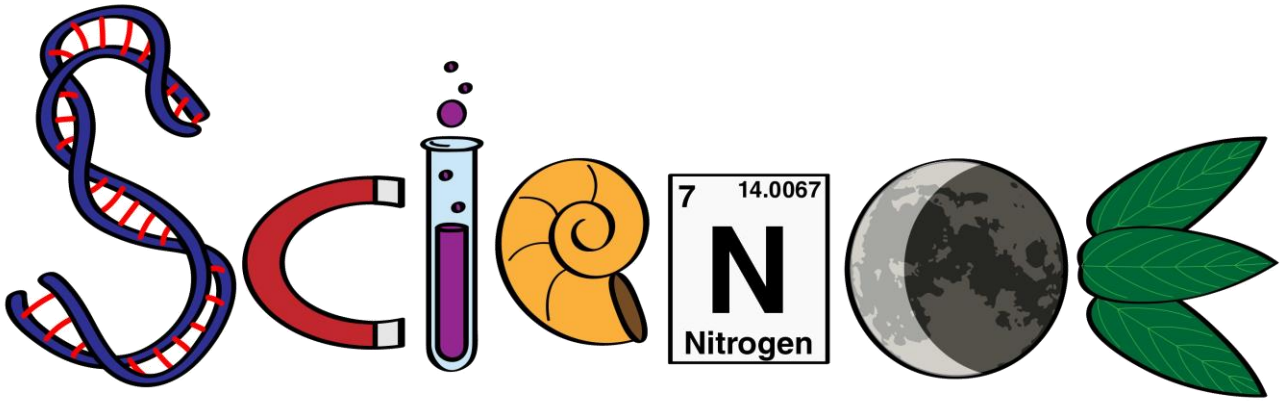
Living Labs Programs

- Environmental and Water Quality Rotation
- Saltmarsh Seining
- Planet Plankton

Can Field Trips be Valuable for More than Students and Teachers?

Why do we host school programs?

- Inspire conservation
- Emphasize importance of coastal ecosystems
- Assist in providing good educational opportunities
- Be an available resource for scientific data
- Help interpret scientific data
- Replicate scientific procedures



What If We Could Do More with Student Data?

- **Florida Data Science for Social Good program (FL-DSSG)**

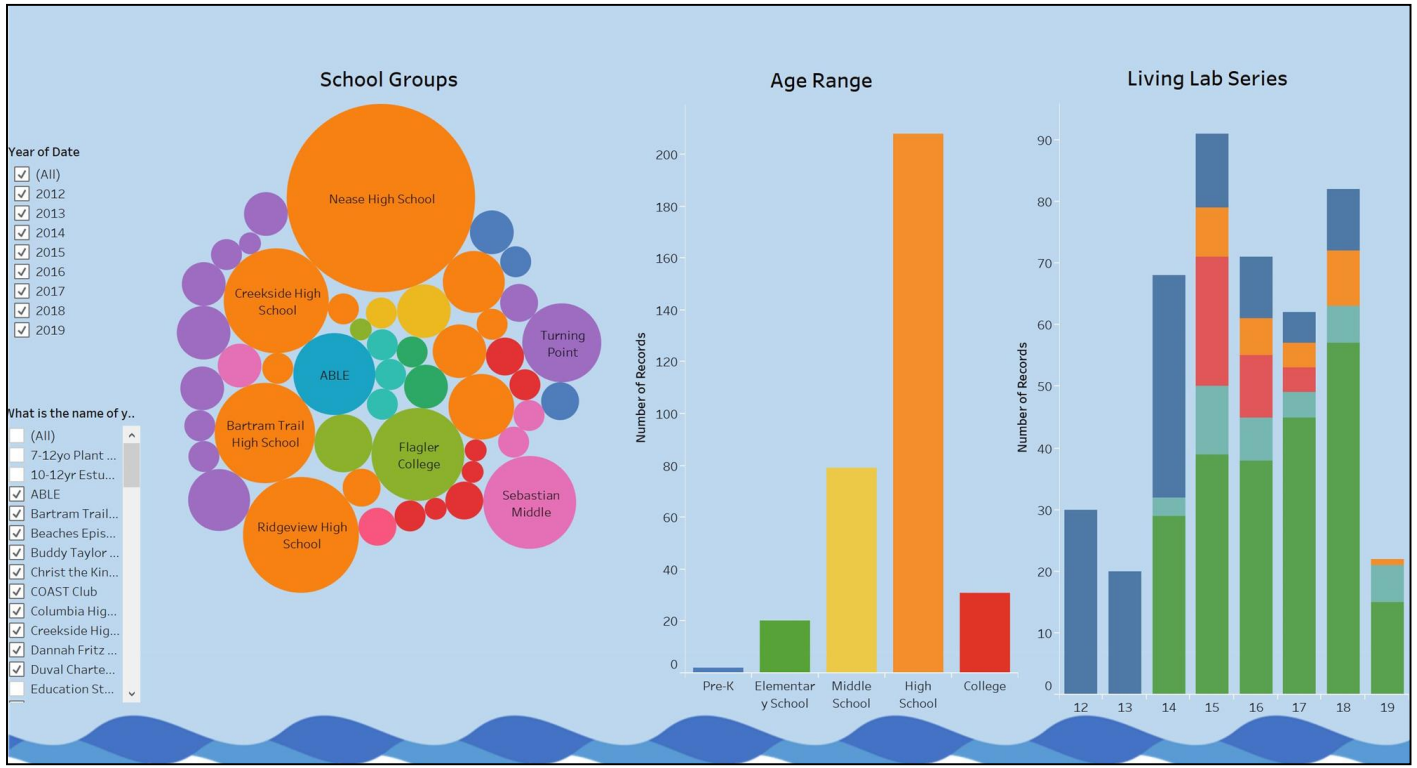
  Blend of data science and technology design intended to solve "wicked" social problem

  - "**Data Science for Social Good** matches your data, your community expertise and experience with data processing methods, computing power, and effective data visualization to help make decisions that are most critical to your organization and to our communities." (FL-DSSG publication)

- Social issues that GTM Research Reserve's FL-DSSG project had addressed had a range of potential:

  - The work GTM does (research, education, stewardship) helps us better understand many environmental/social issues including: Harmful algal blooms, monitoring climate change, and overall ecosystem health.

FL-DSSG Project



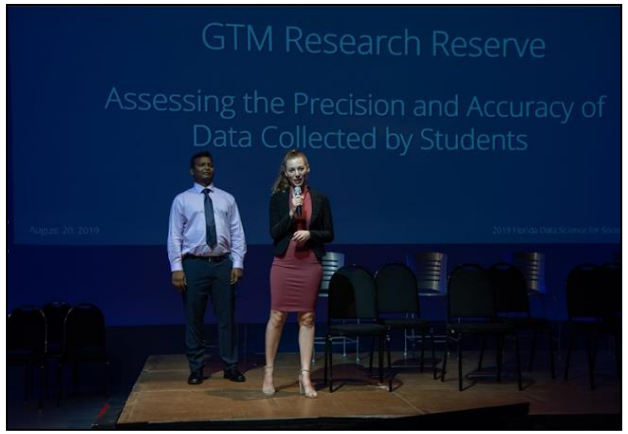
*Graph and information courtesy of the FL-DSSG GTM Research Reserve Project

Middle and high school students participating in education programs have collected 7+years of data– more than 400 water quality and over 300 biodiversity samples.

Project: Assessing the Precision and Accuracy of Data Collected by Students

- Was our student-collected data reliable?
- How did it compare to data collected by trained professionals?
- How did it compare to automated instrument collection?
- Would student data be reliable in a research setting?

FL-DSSG Team



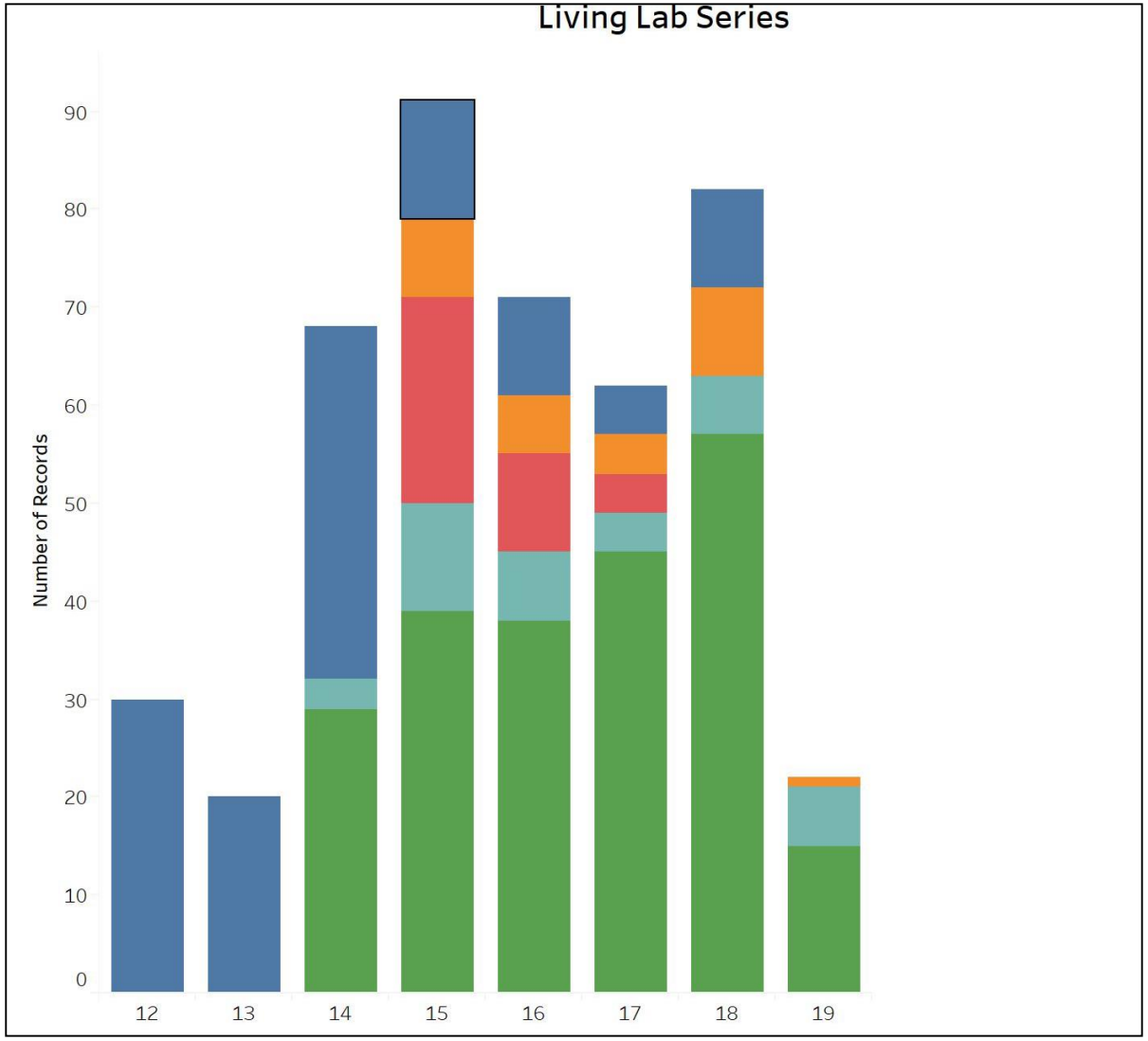
Faculty Team

- Dr. Karthikeyan Umapathy
  - System Interoperability, Data Interoperability, Design Science Research, et al
- Dr. Dan Richard
  - Social Psychology, Quantitative Methods

Student Intern Team

- Ashlee Larramore, Anthropology and Psychology
- Avinash Namilla, Information Systems
- Abigail Conwell, Anthropology
- Nicholas Cole, Public Administration

Student Data Results

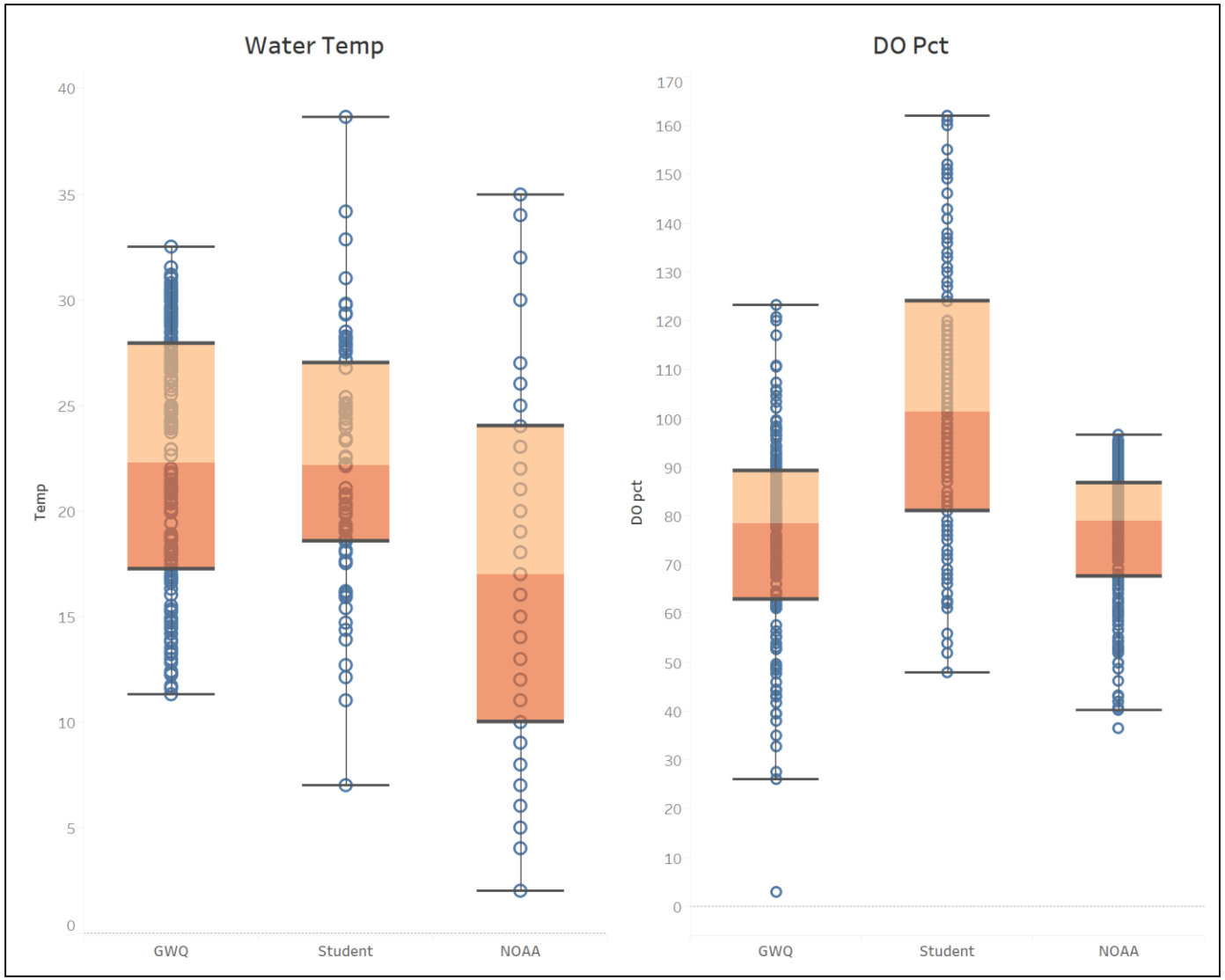


*Graph and information courtesy of the FL-DSSG GTM Research Reserve Project

Living Lab Details

- Saltmarsh Seining was added in 2014 most popular program
- Beach Biosphere longest running program

Student Data Results: Variance and Precision



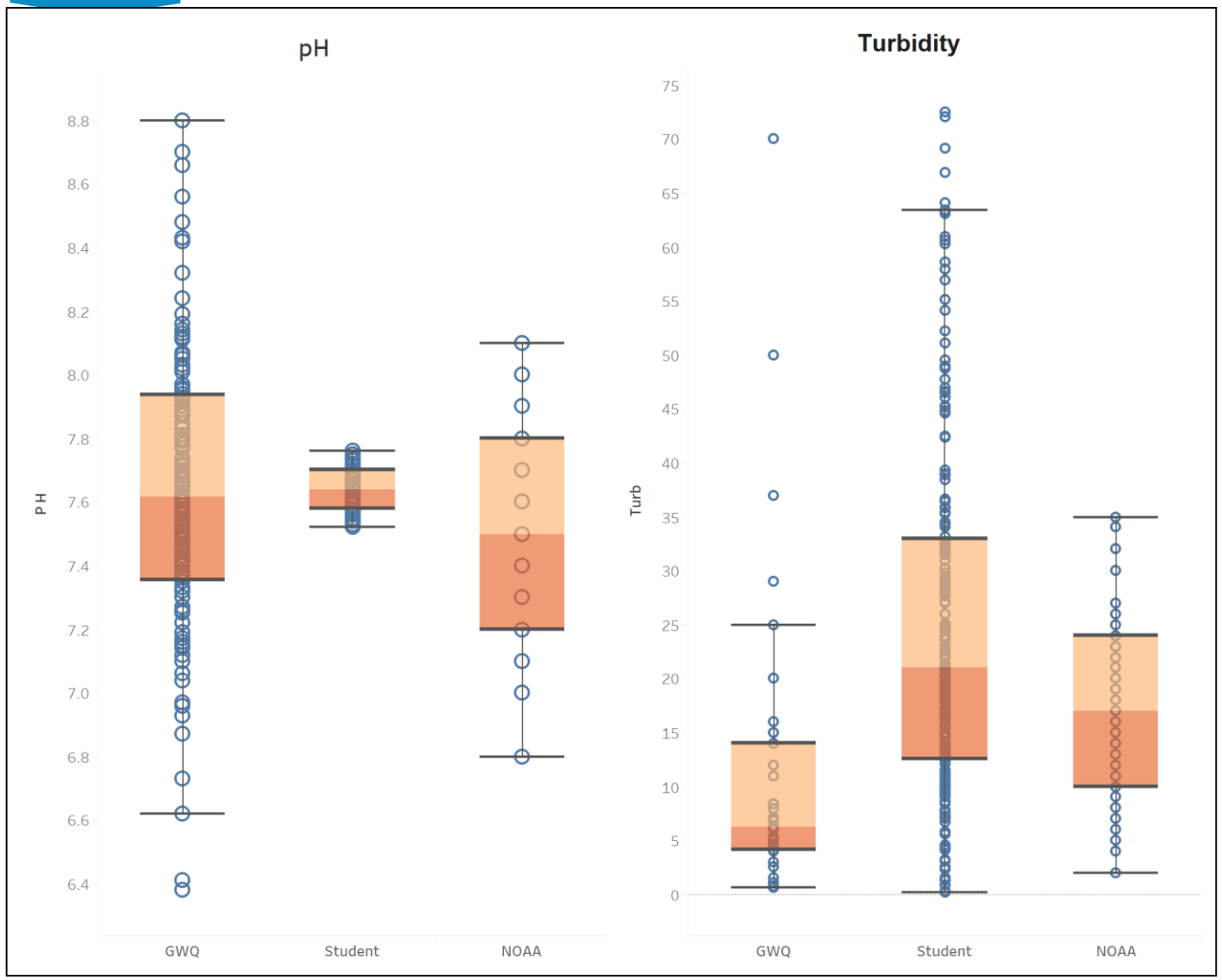
*Graph and information courtesy of the FL-DSSG GTM Research Reserve Project

Analysis of Variance

Water Temperature

- The student data compares well to the scientist (GWQ) data
- The student data shows more outliers than the scientist data

Student Data Results: Variance and Precision



*Graph and information courtesy of the FL-DSSG GTM Research Reserve Project

Analysis of Variance

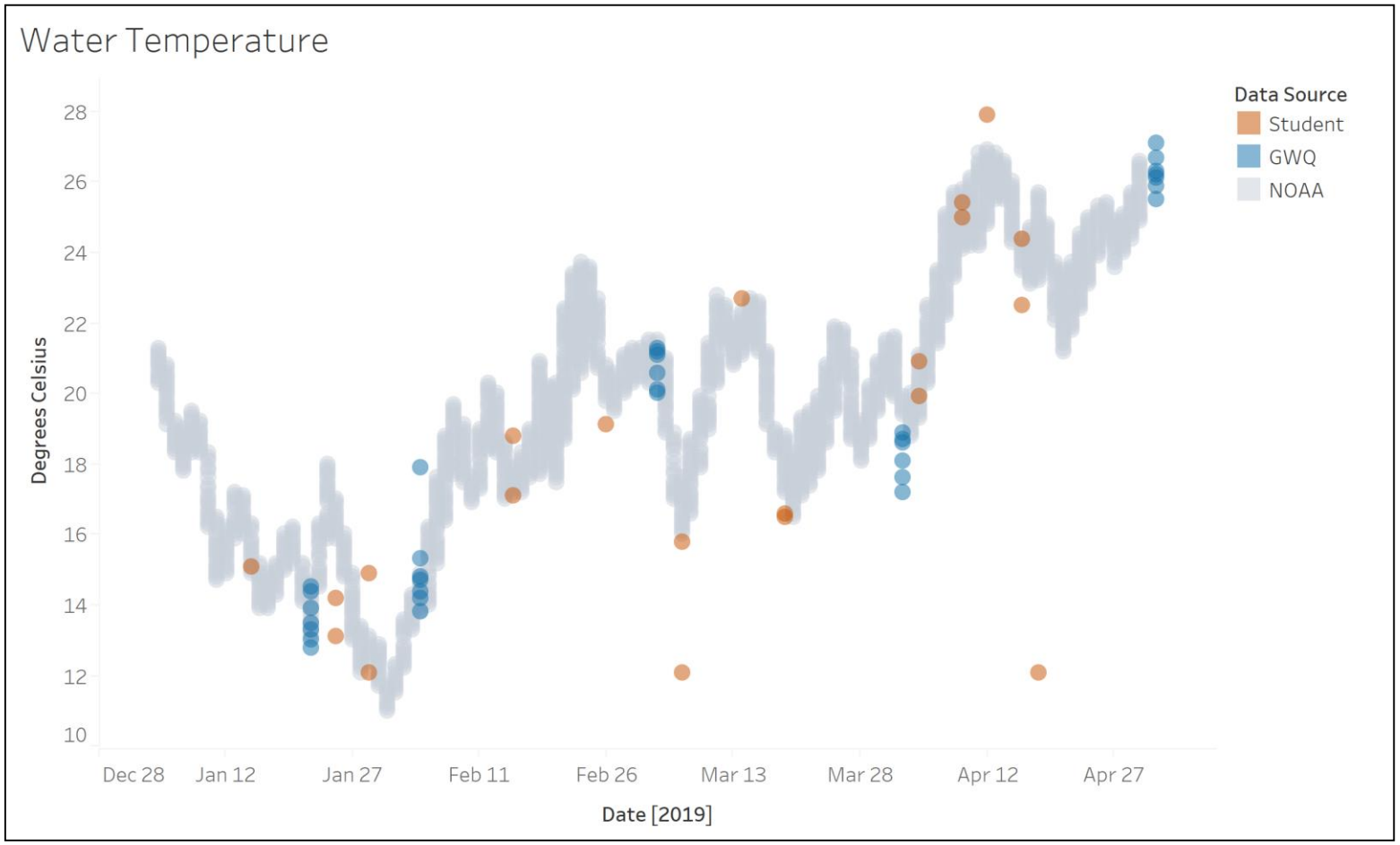
pH

- Student data shows less variability in pH than GTM scientists (GWQ) and the NOAA datasonde
- The difference in variability likely due to equipment differences or calibration

Turbidity

- Student measures of turbidity more variable than other data sets

Student Data Results: Precision vs Accuracy



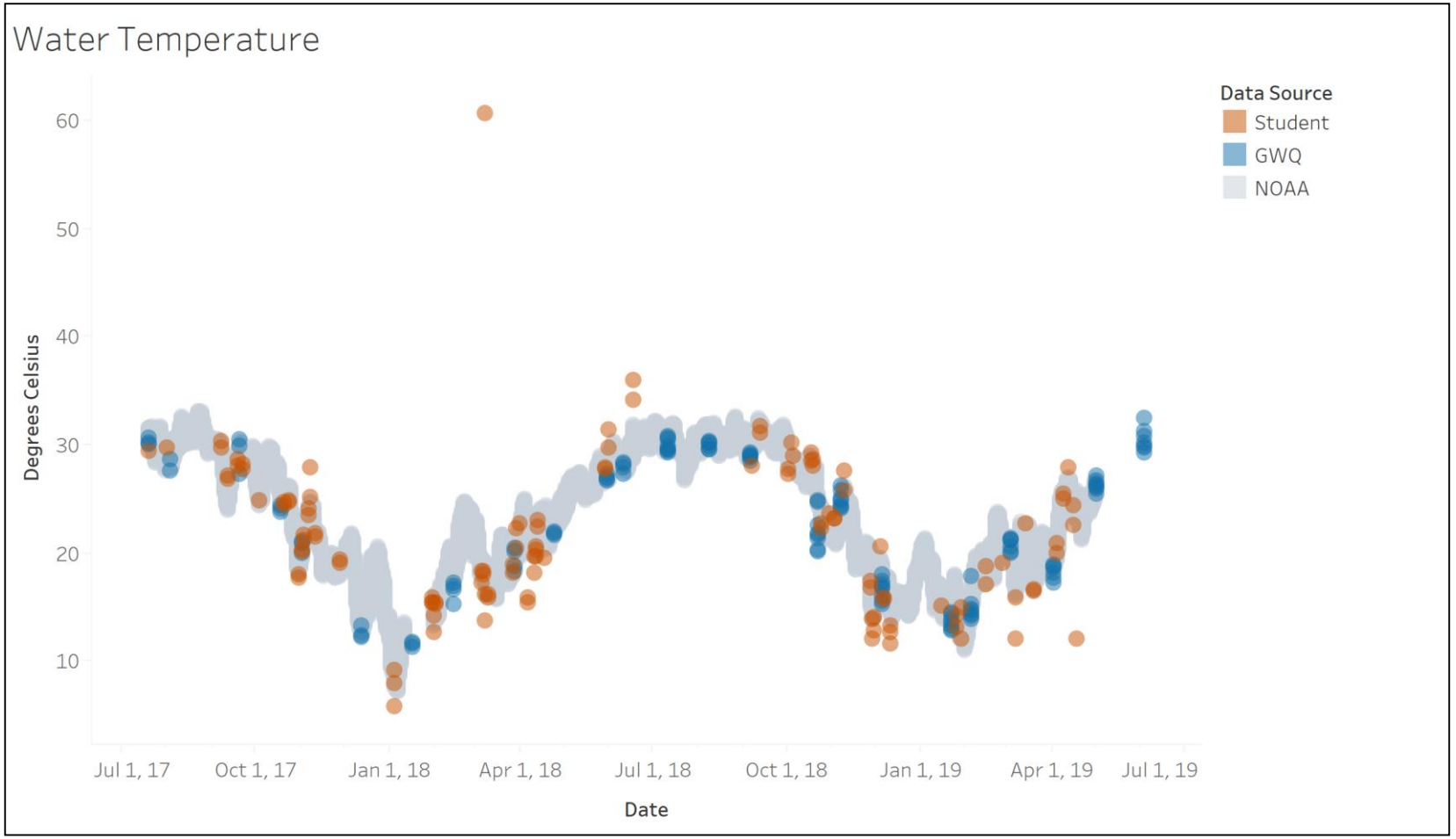
*Graph and information courtesy of the FL-DSSG GTM Research Reserve Project

Control Charts

Allow viewing of data across a timeframe to determine whether the collected data is comparable to expected values across that same timeframe.

Blue markers indicate Scientists data collection across that same time period and orange marks indicate Student Scientist data.

Student Data Results: Outliers

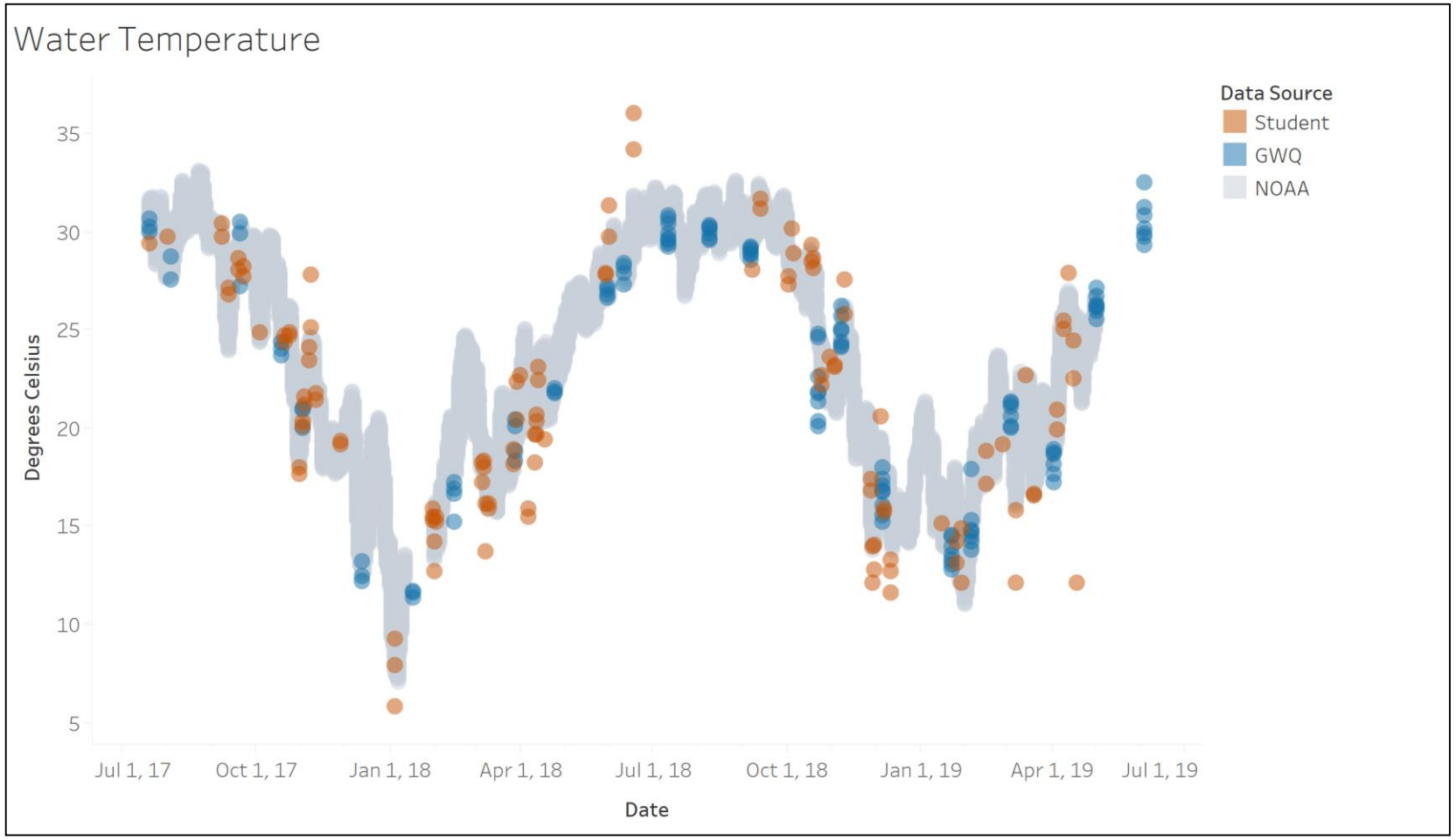


*Graph and information courtesy of the FL-DSSG GTM Research Reserve Project

Control Charts

- Some student data points are outliers. This example, where the students indicated the water temperature was 60° C, is clearly an error.

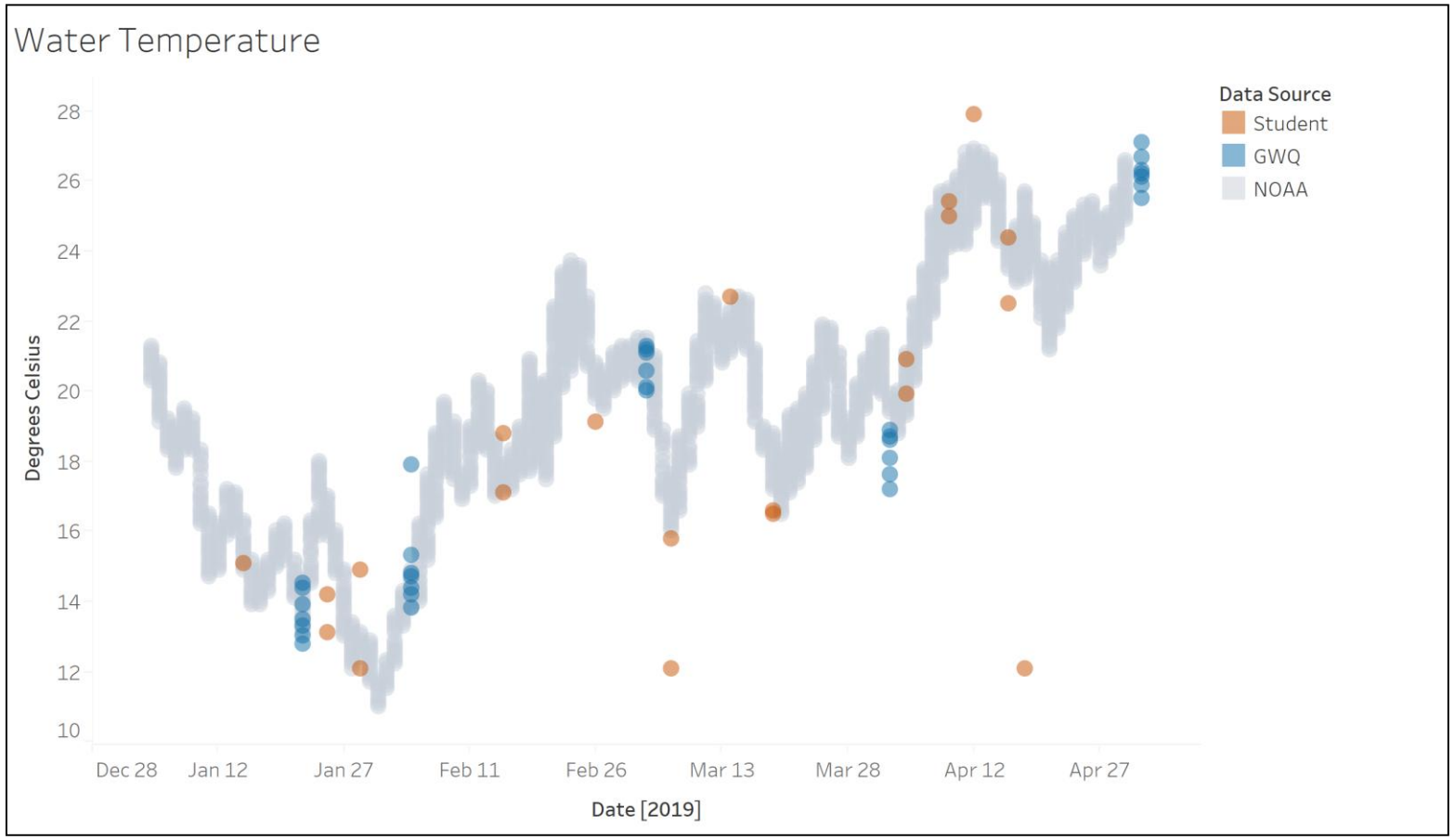
Student Data Results: Syncing Up



- Removal of the outlier shows student data matching with the compared data sets

*Graph and information courtesy of the FL-DSSG GTM Research Reserve Project

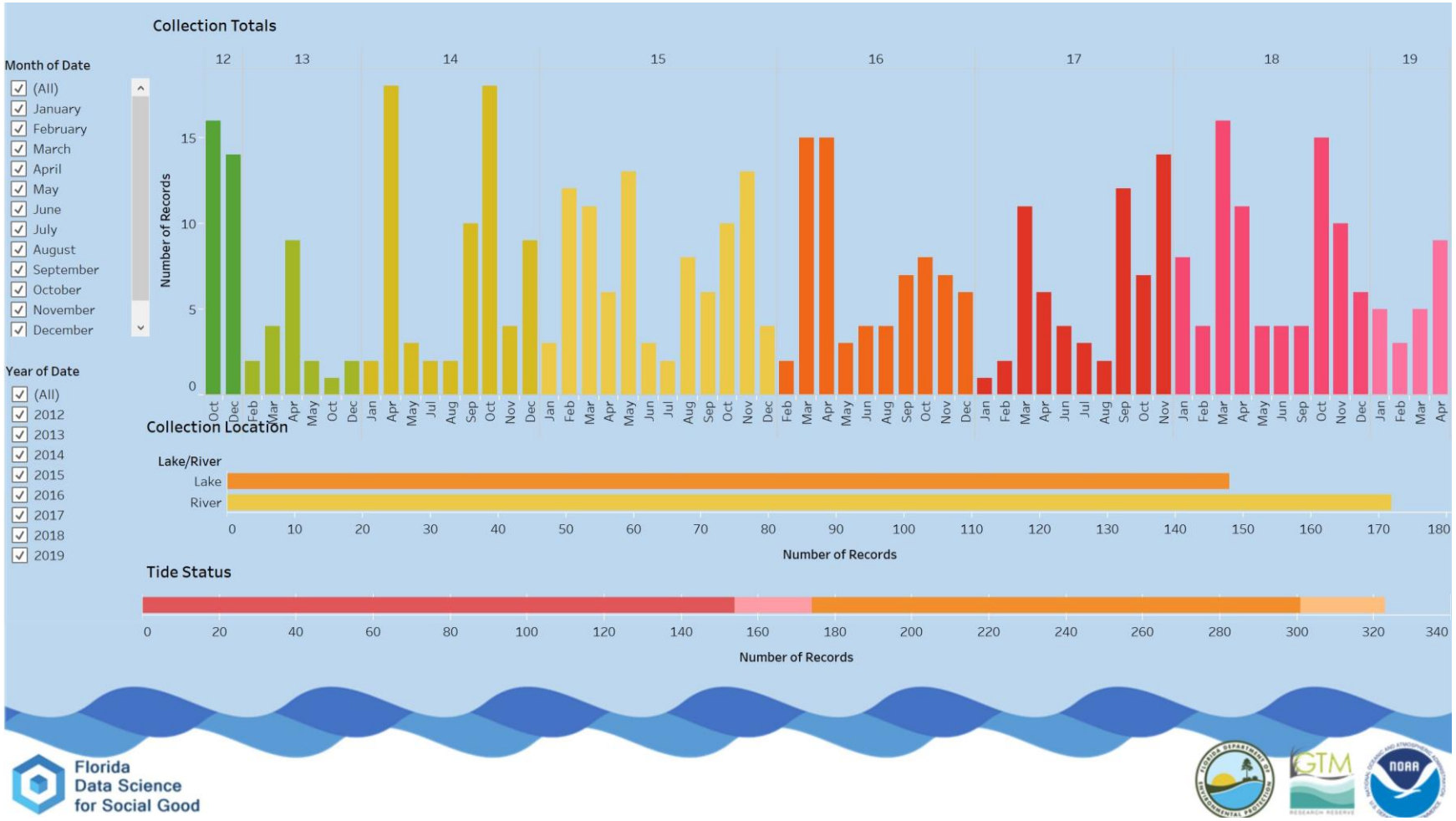
Student Data Results: Quality Control



- A magnification of the 2019 data shows additional student data outliers

*Graph and information courtesy of the FL-DSSG GTM Research Reserve Project

Student Data Results: What Does It Really Mean?



- Number of student data samples taken from Guana Lake and Guana River

*Graph and information courtesy of the FL-DSSG GTM Research Reserve Project

Future Living Labs Series Programs

What do the project results really mean?

- Past data can be used as a baseline

Future Plans

- New YSI equipment
- Equipment use and calibration training
- Maintenance and calibration logs
- Quality control and quality analysis procedures
- Reduction of limitations

Thank you!

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