Tiny tutorials: Supporting virtual learning by making data more accessible

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NOAA Office of Education
2020 Virtual SOS Users Collaborative Network Workshop
Who am I?

- **NOAA Office of Education, Outreach & Education Coordinator**
  - Since 2018 at NOAA HQ in Silver Spring, MD (but now at home);
    Anacostan/Nacotchtank & Piscataway ancestral land
- Bachelor’s in biology, University of MD, Baltimore County
- Master’s in ecology, evolution, and marine biology, UC Santa Barbara
- Informal educator for 10+ years prior to joining NOAA
Who are you?

- Where do you work or where do you want to be working? How many years have you been in your field?
- Do you work with data?
- Do you work with data and public education or communication?
Agenda

- Why is data important?
- How can people engage with data?
- What is a tiny tutorial?
- How did we make our tiny tutorials?
- Final tips
Data!

NOAA View sea surface temperature departure, October 2020  
https://www.nvlnoaa.gov/view/globaldata.html#ANOM
Ways anyone can engage with data

- Data collection
  - Observations
  - Experiments
  - Models/simulations

- Data analysis and interpretation
  - Comparisons
  - Combining different data sets
  - Statistics

- Citizen science!
  - Education at home citizen science resource collection: https://www.noaa.gov/education/resource-collections/education-at-home/citizen-science
Ways anyone can engage with data

- Watching
- Replication
- Guided Analysis
- Problem-directed discovery
- Open-ended discovery

Most direction → Most independence

Science Education Resource Center at Carleton College: How students engage the data [https://serc.carleton.edu/sp/library/twd/modes_engagement.html](https://serc.carleton.edu/sp/library/twd/modes_engagement.html)
Why is it important to teach with data?

- Data is all around us
- Data connects your audiences to their world
- Data analysis skills prepare students for many careers
- Data literacy leads to science literacy
Data is built into NGSS

- Next Generation Science Standards (NGSS) has data as a concept throughout
- Included in Crosscutting Concepts, Science & Engineering Principles, Engineering Connections, and Nature of Science Connections
- Science & Engineering Practices has a whole section called “Analyzing and Interpreting Data”
Data is built into NGSS

**Analyzing and Interpreting Data**

Scientific investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Scientists identify sources of error in the investigations and calculate the degree of certainty in the results. Modern technology makes the collection of large data sets much easier, providing secondary sources for analysis.

<table>
<thead>
<tr>
<th>Primary School (K-2)</th>
<th>Elementary School (3-5)</th>
<th>Middle School (6-8)</th>
<th>High School (9-12)</th>
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</thead>
<tbody>
<tr>
<td>Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</td>
<td>Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.</td>
<td>Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.</td>
<td>Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.</td>
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<tr>
<td>Record information (observations, thoughts, and ideas)</td>
<td>Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.</td>
<td>Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.</td>
<td>Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.</td>
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<td>Use and share pictures, drawings, and/or writings of observations.</td>
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<td>Use observations (firsthand or from media) to describe patterns and/or</td>
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NOAA has so much data!
When it comes to using a new online data portal, sometimes the first few clicks are the hardest.
Tiny tutorials: A simple way to explore data

- 5-8 screenshots with instructions
- Stitched together in a gif, but also presented as slides
- Created for a non-technical audience
- Does not show all features of a data product
- Find our tiny tutorials at: noaa.gov/tiny-tutorials
Tiny tutorial: Historical hurricane tracks

- Made without input from subject matter experts

[Image: NOAA Satellites: Six tropical systems swirl around two oceans](https://www.nesdis.noaa.gov/content/six-tropical-systems-swirl-around-two-oceans)
Tiny tutorial: CrowdMag

- Made in partnership with the National Centers for Environmental Information (NCEI)
- Worked with education and subject matter experts from NCEI
  - Screenshots and photos courtesy Trinity Foreman/NCEI/NOAA
What is NCEI?

- The National Centers for Environmental Information
- Part of the NOAA National Environmental Satellite, Data, and Information Service (NESDIS)
- The home of NOAA data: *The Nation’s leading authority for environmental data, and manage one of the largest archives of atmospheric, coastal, geophysical, and oceanic research in the world.*
- Explore more at [https://www.ncei.noaa.gov/](https://www.ncei.noaa.gov/)
What is NCEI?
Tiny tutorial: CrowdMag

NOAA Education
Tiny tutorial
CrowdMag: Crowdsourced magnetic data

noaa.gov/education
Download the CrowdMag mobile application from Google Play or the Apple App Store.
Open the application and tap “Record” to begin recording your “magtivity.” It is best to do this outside while you move around.

“Magtivity” is a magnetic activity recording that uses your phone’s internal magnetometer to measure the magnetic field of an area.
Then:

Open the application and tap “Record” to begin recording your “magtivity.” It is best to do this outside while you move around.

“Magtivity” is a magnetic activity recording that uses your phone’s internal magnetometer to measure the magnetic field of an area.

Magtivity = magnetic activity recording.
Make sure to hold your phone out during the magtivity. Watch the data come in as you move around.

Original text:
Make sure to hold your phone out as you record the magtivity readings as you walk.
Pay attention as you approach large metal objects (like bridges) to see how they change the color of your path. Different colors show changes in magnetic field readings.

Original text:

Watch as you approach large metal objects to see how they change the color of your path which signifies changes in the magnetic field readings.
Watch this reading as you approach large metal objects to see how they change the magnetic field readings abruptly.

When finished recording the magnitivity, tap “Pause.”

Then tap “Filter” to remove any noisy (or unexpected) data. These data will still be sent to NOAA, but will make your data visualization look cleaner.

When finished, press “Pause” and “Graph” to see the graphical depiction of the data.
You will be brought to a graph of the magnetic readings measured.
Select “Filter” to remove erroneous readings.

Note all dramatic changes in the magnetic field measured by spikes in the graph.
Select “Map” to look at the specific location of points measured.
Save the event with a unique name for later reference.

After you tap “Save,” the data will be sent to NOAA to help with their science!

Original text:
Save the event with a unique name for later reference.
Once you hit save, the data are automatically sent to NOAA to help in their science!
Select specific dots to see the time recorded and the associated magnetic reading [and see if you can correlate it with an object in the area, such as a bridge, pipe, or powerline].

Select “Settings” to export the data.
Then:

Once recorded, you can select specific dots to see the time recorded and the associated magnetic reading. See if you can correlate higher and lower readings with objects in the area, such as a bridge, pipe, or powerline.

Blue spots indicate areas with a low magnetic field value. Red dots indicate a higher magnetic field value. If dot colors are consistent, there aren’t any magnetic disturbances.

Do red and blue dots correlate with objects in the area, such as a bridge, pipe, or powerline?

[If your values are constant along the path then you don’t have any magnetic disturbances.]

Select “Settings” to export the data or to change the magtivity settings.
Select “Export my data” and select the recording you wish to save.

This will give you the ability to email the complete data file in CSV format.
Final tips

- Identify data that can be useful for your intended audience
- Use plain and inclusive language
- Keep it simple, keep it short
- Keep it visually consistent
- Edit, edit, edit

Before you leave the house, look in the mirror and remove one accessory. 
-Coco Chanel
Thank you!
Any questions?

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