Graphing the Drought

Key Topics: Water Cycle, Watersheds, Precipitation, Drought, Graphing
Grade Levels: 6-8
Inside

Lesson Overview:

In this lesson students review the water cycle by diagraming terminology, learn watersheds to better understand human impacts on water resources, especially through local geography, and graph precipitation data to visualize the severity of California's drought and become familiar with digital graphing.

Suggested Time Allowance:

Part 1 - Watershed Intro & Data Familiarizing: 15 minutes
Part 2 - Graphing: 25 minutes
Part 3 - Graphing skills + Excel data tutorial: 20 minutes
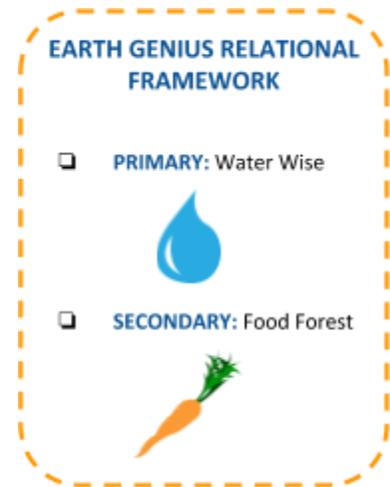
Suggested Activities Learning Objectives by Grade Level:

➢ MS:
  ○ MS-ESS2-4 How does water cycle, and what drives each step of the process?
  ○ MS-ESS3-2 Using data, forecast future droughts and suggest ways to mitigate their effect.

Essential Question(s) that Connect CCCs and SEPs:

● How can we use math to describe and measure this scale of the drought? (Scale; Using Mathematics and Computational Thinking)
● What does the data tell us about the weather patterns or climate in our watershed? (Energy & Matter; Analyzing & Interpreting Data)

Materials:

This activity is not to be done outside for upper grade levels as it primarily involves computers and data entry. To make it appropriate for outside, you could take precipitation data and make your own poster chart and do outside with upper grade levels on their own graphing paper. For younger grades, you could easily adapt to being outside and it will involve a different kind of experiment for understanding water cycles. See adaptations section at the bottom.

● Powerpoint
● Projector (or Smartboard) with Computer Screen displayed with Excel program opened and Internet access
● Chromebooks (or graphing paper and pencils)
● Recent annual precipitation by month and historic average precipitation by month -- data
● Index cards (for TOD)
● Update by having your own copy of the precipitation data for your schools' city and year and use this template as a guide HERE

- Navigate and get familiar with this website so you can understand what watershed the school site is in and know where to easily locate information about their local watershed: http://slowatershedproject.org/

EG Team Support Needed:

- Possible tutorial in person about Excel and/or Google Sheets

Prep:

- Distribute or reserve Chromebooks for your classroom
- Read over what watershed your school is in and update the Powerpoint accordingly. Use http://slowatershedproject.org/ to understand the watershed. Make sure to make a copy and then you can edit!
- Set up Powerpoint and make sure teacher and you have discussed plan for that (are you sending the file to them, bringing a USB stick, is the program you are running it on going to work, etc)
- Have students open precipitation data ahead of time (if possible)
- Google Sheets is a similar to Excel. Understand how to make a graph, label, and be confident in activity procedure BEFORE you show and lead students!

Activity Procedure:

Engage:
Have students log onto their Chromebooks while introducing the lesson and lower their screens to courtesy mode to indicate completion.

Ask students 'How many of you remember learning about the water cycle?' Ask them to recall evaporation, condensation, precipitation and runoff terminology.

Use the purple dotted boundary from the water cycle diagram on Slide 2 to segway into introducing the concept of a watershed. Probe by inquiring about the compound word 'watershed'-- 'What does it mean to shed (*verb*) something (in contrast to the other definition of shed (*noun*))?'
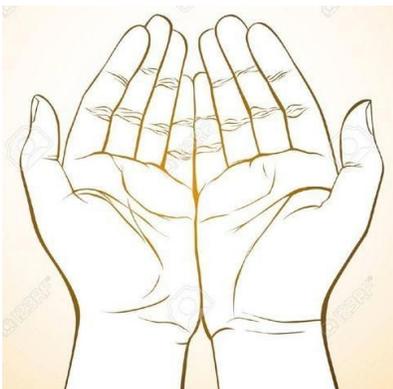
Comprehension Check

Explore:
Go to Slide 3 and emphasize the definition of watershed by breaking it down into its key components: (1) area of land [that] (2) drains [to a specific] (3) outlet.
Have them say it together as a class. Have them make a watershed with their hands.
Fingers = streams/rivers/tributaries; upper tips of fingers are your headwaters
Middle of two hands = main river
Skin = land formations; different topography (valleys, mountains)
Perimeter of outer hands = ridgeline; watershed boundary
In between forearms = Ocean

Another simple definition of a watershed is a 'valley'.

Go to Slide 4 and have students name the local body of water. Visit this website to show them and locate their watershed: http://slowatershedproject.org/

Have students guess which cardinal direction water drains before going to Slide 5

Pick a student to come up to the board and trace the outline of the local watershed. Tell them it's like connecting the dots except the dots in this case are mountain tops

Explain:
Show students how to download and open precipitation data from their class website
- PRO-TIP: Tell students to ask for help from their neighbor if they fall behind before asking you for help.
- PRO-TIP: If there is a technical difficulty with a Chromebook (connection to wifi etc.), have the student close their laptop and work with an elbow partner

Have students download precipitation data.

Elaborate:
Instruct students on how to use the functions to SUM() monthly precipitation to calculate annual precipitation.

Instruct students on how to make a graph using the data. Ask them which type of graph best illustrates the data (hint: line graph). Show them how to add title, legend, axis titles and change axis intervals.

Evaluation:

Comprehension Check

Was there any data sets that surprised them? What was significant about the data? Name one thing that they learned how to do today.

What could we do to better take care of our water during each season? Ex. Store it better when it is raining, mulch the earth when it is too hot, etc.

Go to the ticket-out-the-door slide and ask them to write down their answers on a piece of scratch paper or index cards. If there's extra time, have students share their answers.

Also, refer back to the Learning Objectives for your grade level and ensure that they have been met by asking the given learning objective question.

Extension Activities:
- Compare other year's of same city or local cities and watersheds and present a classroom exhibit on it!
- Find a local meteorologist as a guest speaker to talk about local impacts to water supply and weather/climate patterns and changes
- Ciclo del Agua: Video Lesson
  - https://www.youtube.com/watch?v=JXv643OKCB4

○   https://www.youtube.com/watch?v=2qyM9iKllfE

Tips and Caveats:

- [How to make a chart or graph in Excel (that can be used for Google Sheets)](#)
- [Water Cycle Picture](#) to color
- [Water Cycle Boogie Video](#)

Adaptations for K-5

4-5: Have students graph the drought by using graph paper, clipboards, and a printout of the precipitation data. Data can be rounded to make it easier for graphing. Guide students in how to make the line graph (axis names, axis intervals, etc.)

K-3: If you want to introduce the drought to young students, begin by reviewing the water cycle.

Have students do the "water cycle boogie" and color in the water cycle picture linked above.

Challenge students to create their own water cycle! Have partners (or you as the teacher for Kindergarten students) take a clear plastic container and fill it partway with soil. Then they can plant a seed or a small seedling or plant cutting. Water the plant and then cover the top with plastic wrap or with a clear plastic lid.

Put the container in a sunny place and have students observe what happens. They may want to record, draw, or photograph their observations in a chart and measure their plants' growth. Students should see condensation on the sides of the container.

Get students to ponder the notion, "How do we get water when it isn't raining?" as a comprehension check (ex. Pump wells, aqueduct, water treatment plants, aquifers, rain tanks, etc) and "What could we do to better take care of our water during each season?" (ex. Store it better when it is raining, mulch the earth when it is too hot, etc)

Cited Curriculum:

- Inspired by [TechnoKids](#) as a way of engaging on the Google Classroom platform and involving data collection in our program that teaches about watershed stewardship.