SMAP (Soil Moisture Active Passive) Data

Engaging Context Data Integration

Melany Dunivan

SCED 548

Endeavor STEM /Adams State University

Fall 2019

1. Data Source:

Title: SMAP(Soil Moisture Active Passive) Data

Links: https://www.nasa.gov/smap

https://smap.jpl.nasa.gov/

https://www.drought.gov/drought/data-maps-tools/soil-moisture

2. Lesson Enhancement:

The data from the NASA websites will be able to help the students see and compare the soil moisture results in different areas that were taken by the SMAP satellite.

Some new objectives:

1) Learn how knowing soil moisture can help improve weather forecasts, crops/agriculture, monitor floods such as the flood after the hurricane Harvey, monitor droughts and much more.
2) How to calculate percent of change (7^{th} grade math standard) by calculating the wet and dry soil samples and calculating the amount of water held by the soil.
3) Learn about SMAP satellite and how to interpret the map taken by SMAP satellite.
4) Learn how to design a plant container that will keep the soil moist without overwatering it.
5) Learn how to use technology (for research as well as for recording the data and presentation).

It changes the teaching/learning by engaging the students in the phenomena of soil moisture and how knowing soil moisture can provide food that they eat every day. Students will also complete activities that are related to real life application and investigatory activities where the students will investigate, record and calculate the soil moisture of their soil sample over a period of time.

3. Using Data:

I think using data in the classroom, either collected by student-observation or from another source, will help increase students' understanding and they can see the real-life applications. If students can see the relationships, the knowledge will be stored in their long-term memory.

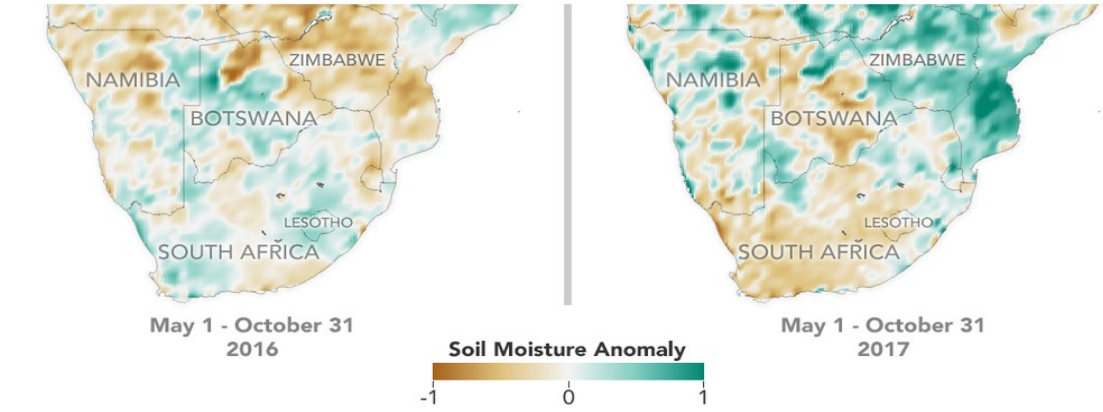
Understanding by Design by Wiggins & McTighe (2011) describes "The point of education is to be able to learn in such a way that the learner (1) grasps

the significance of what is learned and (2) can apply the learning wisely in the future- in other coursework and in life beyond the classroom"

"Research in science education suggests that curriculum based on in-depth understanding of science concepts and instruction focused on investigatory rather than a traditional approach best develop the talents and motivation of students to do science in the real world" (Cotabish et al.,2013, p.3).

4. Visual Presentation:

My rationale for using the data sources is for the students to be able to visualize the results that NASA captured using the SMAP (Soil Moisture Active Passive) satellite. For example: one of the data shows soil moisture anomaly in a certain region from one year to the next and how it affected the crop forecasts.



NASA's Soil Moisture Active Passive satellite takes global measurements, allowing researchers and resource managers to identify and compare regions that are drier (brown) and wetter (green) than normal, even if they are far from weather radar or water gauges.
Credits: Credit: Joshua Stevens/NASA Earth Observatory)

Students can search the drought level in the area where they live through this website: https://www.drought.gov/drought/data-maps-tools/soil-moisture

Science: Students will explore soil moisture by collecting soil sample from the place where they live. I teach online so I have students from all over the state of Colorado so they will have different soil samples that they will be able to compare. They will determine the best areas to plant crops. They will support their conclusion based on their data and observation.

MS.ESS2.C: The Roles of Water in Earth's Surface Processes

Engineering: This project can be extended to have the students design a plant container and determine which is the best model to keep the right soil moisture for plant growth. For example:



Technology: Students will use technology to research and view SMAP data. They can use Excel to create a table and record their data. They can write their report using Word, create a PowerPoint or video presentation, etc. Another element of technology is learning how the SMAP satellite works.

Math: Students will plot their data on a coordinate graph and calculate the percent of soil water by using this formula:

$$of\ soil\ water = \frac{(mass\ of\ wet\ soil \in grams - mass\ of\ dry\ soil \in grams)}{mass\ of\ dry\ soil \in grams} x\,100$$

7.RP.A.3 Common Core : Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

5. Interdisciplinary STEM:

The use of the data can be integrated across the interdisciplinary content in science, technology, engineering and math as shown above. It also has the interdisciplinary connection to Language Arts as students will collaborate in discussions, read, write and present their findings. It has interdisciplinary connection to Social Studies as they read and analyze the SMAP data on the maps. Students can make inferences and predictions of how environmental issues of a place can influence its economy, culture and trade patterns.

ELA Standard 1: Oral Expression and Listening, Standard 2: Reading for All Purposes & Standard 3: Writing and Composition.

- Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly. (CCSS: SL.7.1)
- Engage in a wide range of nonfiction and real-life reading experiences to solve problems, judge the quality of ideas, or complete daily tasks.
- Reach an authentic audience with a piece of informational or persuasive writing.

Social Studies Standard 2: Geography

- Interpret maps and other geographic tools to find patterns in human and physical systems (DOK 1-3)
- Describe the characteristics and distribution of physical systems, cultural patterns and economic interdependence to make predictions. Topics to include but not limited to environmental issues and cultural diffusion (DOK 1-3)
- Explain how the physical environment of a place influences its economy, culture, and trade patterns (DOK 1-2)

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