Engaging Context Data Integration
Methods of STEM
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Data Source:

Tracking Water Using NASA Satellite Data

https://www.jpl.nasa.gov/edu/teach/activity/tracking-water-using-nasa-satellite-data/

Lesson Enhancement:

I am currently teaching a STEM unit that I have titled "Water, Is it Important? " This unit encompasses many of the 5th grade Next Generation Science Standards. The data integration project has allowed me to bring in another aspect that I have not included in the past. After locating and researching various data sources (finding many that I would like to use, but will need more time to plan for their use) I decided to use the NASA Satellite Data and the lesson plan that they provided.

My fifth grade class has recently completed the activity "How much water is in the world?" from the Mystery Science website. Students used data provided in the lesson to estimate how much fresh and salt water there was in the area of the world that they were assigned. The class then compiled the estimates to produce a graph that compared the amount of salt, fresh water frozen and fresh water on Earth.

The *Tracking Water and Using NASA Satellite Data* lesson plan is a nice continuation. Students are looking closer at freshwater distribution on Earth and in particular New Hampshire, the state we live in. As the lesson plan states "Using real data from NASA's GRACE satellites, students will track water mass changes in the U.S. Students will estimate water resources using heat-map data, create a line graph for a specific location, then assess trends and discuss implications."

Tracking Water and Using NASA Satellite Data has brought many new ideas and concepts that were not being taught in my original unit. Students are looking at gravity and Earth's gravitational field, they are using heat maps (which don't show temperature) as a data source, and are learning more about NASA programs and using of satellites. Students are looking at the importance of tracking water, learning what a trend is and then explaining what trends they are observing using the data provided. Students are using higher order skills as they progress through the lesson.

Using data in the teaching of STEM units provide students with the opportunity to apply what they know and have learned. Students use the data to gather information which they then use as evidence to form their own conclusions about what is occurring. Instead of being told they are discovering on their own.

Using Data:

I believe that it is very important that students use data in the classroom. Students should be collecting their own data from experiments and using data provided from other sources. After reading the articles, participating in the online discussions and the live sessions, it has become quite clear on the importance of data and its use in providing evidence in both science and engineering. The article *What's in a Word?* by Renee Schwartz explained the difference between data and evidence. Evidence is a result of data and the interpretation of the data. "So data are the observations; evidence is the support that justifies a conclusion."(Schwartz,2007) The article *Scientific and Engineering Practices in K-12 Classroom* by Rodger Bybee says that "Both science and engineering involve the analysis and interpretation of data." "The aim for students at all grade levels is to learn how to use evidence to formulate a logically coherent explanation of phenomena and to support a proposed solution for an engineering problem." Students need to use data as part of their evidence to help in the construction of explanations in science and the designing of solutions to a problem in engineering. (Bybee, 2011)

Visual Presentation:

Why did I choose to use the NASA provided heat maps and lesson plan? One of the main reasons I chose this source was because of its close connection to the unit that I am currently teaching in my classroom. Another reason was it was readily available and did not require much preparation. This allowed me time to do the activity with my class.

The data that is obtained from the heat maps produced from GRACE satellites shows the groundwater that is stored in the largest aquifers on Earth. It shows the loss and growth of water in millimeters over a certain year. The data is for 10 consecutive years. Students needed to use many curriculum areas in accessing, interpreting, and analyzing the data by creating graphs. The students participated in discussions of why it is important to track water on Earth. Due to the number of maps provided for each year, my students accessed the data through Chromebooks and Google classroom. This was the first time my students have used the Google classroom platform. Students needed to locate New Hampshire on the maps using their knowledge of political maps. The data shown on the maps is shown by changing color which indicate changing water amounts. Students estimated the water loss or growth for each month by using the color bar at the bottom of each map. Students took the data collected which was in millimeters and converted it to centimeters. They constructed a line graph. The students presented their group's line graph identifying any trends and answering the question "What months does the gravity (water storage) increase or decrease?" Students were able to explain why it is important to track water on Earth.

Interdisciplinary STEM:

The usage of the heat map data from NASA's GRACE satellites provided many ways to integrate across the content. To use the information that the maps provided, students needed knowledge from the STEM content areas along with other content areas. Math is very important. Students needed to be able to convert correctly in the metric system. Using the data collected, students needed to create a line graph. The line graph needed to include T.A.I.L.S. (Title, Axes, Intervals, Labels, Scale). Technology was an integral part of accessing the data. My students have used the Google documents and Google site before, but Google classroom was new to them. A large portion of class time was used for introducing the classroom and making sure students new how to join and access the information that was shared. Social studies content was important in the understanding of reading maps and locating information on the maps. The key (color bar) was used in the estimating of water loss and growth. Students needed to use speaking and writing skills in the presentation of their graphs and explanation of the importance of tracking water. The explanation should include science knowledge from previous taught lessons in the unit. The data source and lesson helped me greatly in integrating across the STEM content and other content areas as shown by the following standards.

Science:

5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.

5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Technology:

ISTE Standard: 3c Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.

Mathematics:

5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multistep, real world problems.

5.G.A.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis,

with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

English/Language Arts

ELA-Literacy.W.5.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

ELA-Literacy.SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Social Studies – NH Standards

SS:GE:1: The World in Spatial Terms: Students will demonstrate the ability to use maps, mental maps, globes, and other graphic tools and technologies to acquire, process, report, and analyze geographic information.

References

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Bybee, R. W. (2011). Scientific And Engineering Practices in K-12 Ckassrooms. *Science and Children*, 10 - 16.

Schwartz, R. (2007). What's in a Word? *Science Scope*, 42-47.