Authentic Data Integration

Heather Battjes

Methods of STEM Education

Dr. Eliza Bobek

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Data Sources:

My NASA Data's Earth System Explorer;

https://mynasadata.larc.nasa.gov/EarthSystemLAS/UI.vm

NASA Worldview,

https://worldview.earthdata.nasa.gov/

Sites with specific data/lessons related to content to be taught:

Satellite Meteorology at UW Madison

http://cimss.ssec.wisc.edu/satmet/index.html

PBS Learning Media

https://www.pbslearningmedia.org/collection/universe/grade/universe-6-8/

Chicago Botanic Gardens

https://www.chicagobotanic.org/grades_7_9_unit_2

https://www.chicagobotanic.org/grades_7_9_unit_4

Lesson Enhancement:

I am currently exploring the difference between weather and climate with my students as well as different aspects of climate change focusing on how the greenhouse effect and the carbon cycle impact climate change. Students also will explore how the unequal heating of the earth's surface leads to weather changes. My *NASA Data's Earth System Explorer* site allows me to find various data for my students to explore related to sea surface temperature, greenhouse gasses in the atmosphere, precipitation, sea level changes, etc. I think this tool is especially effective for comparing data over long time periods and for what it offers for comparing different types of data over the same time periods. However, the site does have

constraints in that it does not contain current data for several parameters. This is why I also explored *NASA Worldview*, which contains more up to date data that my students would be keen to explore in the regions they live or where their family lives around the world.This site also offers the opportunity to explore cloud cover, precipitation, greenhouse gasses, etc., but I did not like the comparison tool as much as with the *My NASA Data's Earth System Explorer* site. Both of these sites allow for printing or sharing of data also, which can be helpful for choosing specific data for students to explore in the classroom.

As I have a unit upcoming on weather and climate, I also explored a few other sites that offered specific lessons or activities using data visualizations to enhance the learning for students with authentic information. I enjoyed these sites because there is specific, intentional data that is used to help students gain further understanding of weather forecasting, climate change, and satellite imagery. The data used is framed with a purpose and this makes it more user friendly for teachers and students. The *Chicago Botanic Gardens* included some wonderful activities to explore climate and weather patterns and to gain understanding of the impacts of climate change. I found the *UW Madison Satellite Meteorology* learning modules to also be valuable in that they helped to explain some of the different weather phenomena in a student friendly manner, and provided students with an opportunity to explore specific data related to air fronts and satellite imagery to draw conclusions about the weather. The *PBS Learning Media* site also offered video visual data with important key questions for students to consider related to insolation, sea ice changes, precipitation, and the ocean's effect on regional climate.

I think it is vital to include authentic data in lessons and learning activities for students. It is essential that students gain understanding of how to view data as well as how to use data to help explain the changes that we see. It is also important that students are able to recognize data displays that are valid and ones that skew the data for a specific purpose. Students in my class are scientists as they explore data, whether it be data they collect or from other sources. Students need to understand how to analyze various types of data and what the data collected

can show us as we work to predict what may happen next. They can also gain understanding of how to make inferences based on the data that is available to help us to answer our questions. While I do think that the *NASA Worldview* and *My NASA Data's Earth System Explorer* are important tools that my Middle School students could access to begin exploring data on their own, I feel that they can be challenging for them to navigate independently. I think that both of these sites would be better used as a resource for teachers first as students gain an understanding of the different data types and color maps. Once students gain a greater understanding of the different display types, then I think they would be able to explore the sites when provided specific parameters.

Interdisciplinary Context:

The data that I will explore with students in the weather and climate unit could also be used in language arts classes as we explore developing evidence based arguments and using relevant and sufficient information to support a claim. I can also see this data being used in social studies classes where students at our school spend at least one unit focusing on the United Nations Sustainable Development Goals (SDG's). Students choose a goal that matters to them and then explore what is being done in our area to improve our future. The data explored through the sites I shared could be useful in helping students to further understand the problems that they explore related to the SDG's. Of course, math is another great connection with the data. Students can explore changes over time with much of the data sources described above, whether it be the difference in temperatures in a particular ecosystem over time or looking at overall surface temperature changes. Students can investigate the differences, make sense of the data by analyzing the slopes of different lines, or explore how the rates of a specific data set such as carbon dioxide in the atmosphere changes over long periods of time. I have specifically planned for my students to explore digital storytelling with weather also as they work

in groups to create a weather report based on the data they explore about current weather conditions in our area. I also think that it would be valuable for students to analyze other data sets not specifically related to weather, but to general populations such as census data to help further understand the impact that climate change can pose globally as people are impacted on a socioeconomic basis.

Altogether, it is essential to share authentic data with students to help them to recognize what is valid and how to analyze data and make meaning of the information that we are able to collect. Students need to also see the interconnectedness that data can have in helping us further understand the environmental and social challenges we may face. They will be the next people in charge of the world. They will need to have a working understanding of how data can help further our understanding of what is happening in the world, especially in a world where we will likely have even more data than we do today.