Lisa Angell
Engaging Context Data Integration

In the standard Va SOL 4.4a students analyze and report data on temperature and precipitation. This lesson will use climate data from the US Climate Data website, https://www.usclimatedata.com/. I found a lesson on the JPL website that uses this data. Here is the lesson that I will use as inspiration https://www.jpl.nasa.gov/edu/teach/activity/precipitation-towers-modeling-weather-data/.

This data enhances the lesson because students are "doing" science, instead of listening to a lecture on the topic. Students must use critical thinking and communication skills to interact with data. As a student centered investigation, students are immersed in gathering and analyzing the required data from the tables. Student teams search for specific cities and record different data points, then analyze and record temperature and precipitation data. Based on this information, students interpret the data and draw conclusions about regional climate, geography, and wind/water currents. Discourse is promoted due to the variety of data and the differing locations. The lesson provides discussion questions to encourage cross group discussions.

The amount of information provided by the US Climate Data website opens many avenues of analysis. Also include in VA SOL 4.4a (use weather instruments (thermometer, barometer, rain gauge, anemometer) and observations of sky conditions to collect, record, and graph weather data over time; analyze results and determine patterns that may be used to make weather predictions). Teams use these weather instruments, as well as current online data, to collect continuous local weather information during a specified time period to compare/contrast current weather trends to the climate data. Another objective that could be addressed is using classroom discussions and experiences to determine "the importance of monitoring weather data to make weather predictions" (4.4a). Students use the data from US Climate Data and the data they've collected to produce a greenscreen weather forecast on the morning news show. These students offer suggestions about appropriate clothing and activities for the upcoming day.

Teaching and learning using data integration is a game changer for education. The current push to prepare students to be "life ready" includes engaging in the skills of the 5 Cs (critical thinking, communication, creativity, collaboration, and citizenship). Data integration provides the perfect context for students and groups to practice these skills while participating in real world problem solving in a safe, low stakes environment. For example, if students don't predict the weather correctly in class, no one will be in danger. While students are engaged in looking at data sets, teachers are facilitating meaningful discourse and asking probing questions. This frees educators to have deep, meaningful conversations to uncover prior knowledge and misconceptions.

As we prepare our students to be STEM literate, we also need students to become data literate. Kjelvik, Melissa K., and Elizabeth H. Schultheis. "Getting Messy with Authentic Data: Exploring the Potential of Using Data from Scientific Research to Support Student Data Literacy." *CBE—Life Sciences Education*, vol. 18, no. 2, 10 May 2019, doi:10.1187/cbe.18-02-0023. Data analysis, whether it is obtained outside the classroom or gathered from student observations, is a real world application of what actual scientists do everyday to determine validity of their work. However, this analysis is difficult and requires hours of time investment. This investment is not wasted because students are engaged in focused thinking. The data provides a solid context for students to use scientific thinking and reasoning to draw conclusions. Student collected data is more relevant for students, because they experienced that collection. My students enjoy testing their ideas and recording qualitative and quantitative data. Students use this information to inform decisions on prototype design or investigative conclusions. In my opinion, data could be considered a cross cutting concept because it can be used in every "subject".

The data source from US Climate Data fits well with the Virginia standards that are required for fourth grade. Since students must study both climate and daily weather, the data provides context for comparing/contrasting an area's daily weather to climate. This year, the fourth grade teachers integrated weather data in both science and math. The students recorded the daily temperature, sky observations, and precipitation amounts.

During math instruction, students used probability and statistics to make decisions about weather phenomena. Students had to calculate the monthly average temperature and precipitation amount and compare/contrast this information with data from the US Climate Data website. They also used the continuous weather data and created graphs and charts. This information was used to make weather predictions.

The US Climate Data website could be integrated into all STEM content. In Virginia, students are tested on paired passages, which are fiction and nonfiction reading passages that have a related topic. Students could read paired passages on the topic of climate. The Readworks article called "Climates- Global Warming" includes a line graph and *Winston of Churchill: One Bear's Battle Against Global Warming*, by Jean Davies Okimoto, Illustrated by Jeremiah Trammel (Endicott and Hugh Books 2013, 34 pages) is a fiction book on the same topic. The polar bear book could be the impetus for problem solving climate change. Students could also use cross cutting concepts of cause and effect, drawing conclusions, and patterns. Students could write a persuasive article on the topic of climate change. The climate lesson mentioned in paragraph one in this paper could be included in this integrated unit. Also, students could collect additional data on climate change as they become data literate. Math integrates naturally due to VA SOL 4.13 Probability and Statistics strand. Students are introduced to these concepts through simulations. Simulations could be based around weather and climate, and then extend their data literacy by using real data. Students can ask questions about local weather, then use charts and graphs to record the data that is collected. Weather maps and forcasts can be created, then broadcast on the morning news show. Lastly, since we

will be looking a weather maps, geography will be learned. In fourth grade, students must learn the five regions of Virginia, so weather data from each region could be compared/contrasted.