Cecily Phalen-Bartolome
Methods of STEM - Elementary

Authentic Data Integration

Data Source: The Climate Explorer **https://crt-climate-explorer.nemac.org/**

The Climate Explorer website offers access to historical weather data as far back as 1950 and projections though the 2090s. The data is organized into easily accessible maps, charts and graphs charting actual recorded data points against normal ranges. Data can be viewed regionally or locally by day or for extended lengths of time and can be downloaded as well. The Climate Explorer site is operated by the National Oceanic and Atmospheric Administration (NOAA) and hosted by the National Environmental Modeling and Analysis Center (NEMAC) at the University of North Carolina.

Lesson Enhancement

Data from the Climate Explorer website would greatly enhance a third-grade unit on Weather and Climate. The data on the site is easy to navigate and presented in a way that would support comprehension by younger elementary students. In this way, it encourages greater student interaction with the data than other formats such as a table listing daily historic high and low temperatures. The Climate Explorer's easy to navigate interface allows for even younger elementary students to be the researcher, gather data, and interpret the data to support a claim. Additionally, the Climate Explorer website offers a rich variety of data representations including maps, bar graphs, line plots, charts, and data tables. This presents students with an excellent model of how different types of data may be represented in different ways. Thus scaffolding students to meeting NGSS 2-ESS2-1 to represent data in tables and graphical displays to describe typical weather conditions during a particular season. Furthermore, data is available for the contiguous United States and many regions of Alaska. This allows students an opportunity to easily compare different geographical regions within one state or across the country. This offers tremendous support for students to meet NGSS 3-ESS2-2 to obtain and combine information to describe climates in different regions of the world. The Climate Explorer's ease of navigation can help students visualize the wealth of NOAA data in overlays on the same map, supporting young students to conduct more research for themselves, and engage in authentic science practice. This shifts the learning from me as the teacher providing students with fixed data sets to be analyzed to empowering students to engage in research with real data.

Using data in the classroom, beginning at early elementary grades, is crucial to establishing parallels between academic experiences and real-world applications. Using authentic data sources furthermore, lends relevancy to classroom lessons and challenges students to think critically about contemporary issues. This not only is more engaging to most students but also fosters problem-solving practices and critical thinking skills that will continue to serve them in their academic careers and beyond. Ideally, data is utilized in integrated STEM units that afford students opportunities to affect real change in local communities or in support of other forms of project-based or service learning. Furthermore, engaging with real data sets also build mathematical competencies, research, and analysis skills. In short real data supports real learning.

Interdisciplinary context:
The Climate Explorer website can be utilized to support interdisciplinary lessons and an integrated STEM unit. For example, given the increasing occurrence of extreme weather events, California drought records from the Climate Explorer or a map of burn areas from last fire season could serve as anchoring phenomena. A driving question for the unit might be, “How can climate zones best prepare for extreme weather events?” Students might begin the unit by investigating typical seasonal weather conditions. This would support NGSS Science performance expectations 3-ESS2-1 and 3-ESS2-2 as described above. This works in concert with CCSS Math Content 3.MD.B.3 to represent and interpret data by drawing a scaled picture graph and a scaled bar graph to represent a data set with several categories. To solve one- and two- step “how many more” or “how many less” problems, students can compare daily and average temperatures, precipitation, or other data points. Once students develop a concept of typical seasonal weather patterns, they might embark on a comparative exploration of extreme weather events using NOAA webpage on Extreme Events resources (https://www.ncdc.noaa.gov/climate-information/extreme-events). Students could then work to design structures or systems that can help a community prepare in typical seasonal conditions to be ready for extreme events. For example, after examining precipitation data, how might Southern California prepare for extend drought conditions? What kinds of systems should be put in place and how much water should be reserved, if any? How would water be collected and stored? This would engage students in the design cycle supporting several ITEEA standards including particularly 8-13 focusing on the engineering design process. Students would also exercise language arts skills in communicating ideas, explaining their designs, and presenting their findings to the class. Using authentic data from the Climate Explorer can engage students in real-world problem solving that necessitates the use of interdisciplinary skills in concert.