Nature of Science & Math: Analyzing the Presence in Everyday Communication

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Abstract

The article "New research improves wind forecasts for the renewable energy industry" has been analyzed to assess its alignment with many of the Nature of Science practices as well as the Common Core Mathematical Practices. The research practices used to analyze the amount of renewable energy that can be created in the Columbia River Gorge in this study are thorough and responsive to modern scientific and mathematical expectations, such as creating data that is accessible to the public and developing new understandings and conclusions with regard to previous conclusions from other research projects. The researchers have collected data and displayed it in models that are useful for the public and address questions about natural phenomena. The practices used in this research study are outlined below.

Scientific Knowledge is Based on Empirical Evidence

The researchers with the National Oceanic and Atmospheric Administration (Stein, 2018) were collecting data for 18 months with the use of "more than 200 instruments deployed across 50,000 square kilometers," (Stein, 2018). Their data is precise for this region because they were able to collect data over a significant period of time and because they had many instruments measuring data to provide them with substantial amounts of empirical evidence (The Nature of Science in The Next Generation Science Standards, 2013). The amount of time that data was collected and the number of devices ensures that they have "multiple lines of evidence supporting a single explanation," (NOS in NGSS, 2013).

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Prior to the data that was collected by NOAA beginning in 2017, accurate predictions of wind conditions were "a problem that had long vexed grid operators," (Stein, 2018). New data collected during this study allowed scientists to modify their previous understands "in light of this new evidence," (NOS in NGSS, 2013). The evidence that was collected was confirmed over the 18 months, allowing new conclusions to be drawn. Scientists can now make new hypotheses and they believe that the modeling team will "improve wind forecasts by 15-25 percent," (Stein, 2018).

Science Addresses Questions about the Natural and Material World

The area where NOAA researchers were studying wind patterns has "highly variable wind conditions" due to the "dramatic topography," (Stein, 2018). This has caused issues in the past with scientists trying to predict weather. While "not all questions can be answered by science," scientists do create models and use tools that help them explain "what can happen in natural systems," (NOS in NGSS, 2013). Scientists practice using evidence to address questions about

the natural world and by making "human decisions about the use of knowledge," they are able to do things such as "improve wind forecasts by 15-25 percent," (NOS in NGSS, 2013; Stein, 2018).

Model with Mathematics

Researchers for NOAA used data collected with their more than 200 instruments to create a model for wind patterns in the Columbia River Gorge (Stein, 2018). They are using these models to "apply mathematics…to solve problems arising in everyday life and society," (Standards for Mathematical Practice, n.d.). Scientists are also trying to make a "publicly available model" so that people outside of the industry have access to the data. The latest model is more accurate and has analyzed "relationships mathematically to draw conclusions," about what scientists can expect from wind patterns (Standards for Mathematical Practice, n.d.).

Look for and Make Use of Structure

The researchers with NOAA are responsive to patterns they see within their wind pattern data. Dave Turner noted that the patterns have "already led to improvements in our ability to forecast low-level winds," (Stein, 2018). The data they have collected allows these scientists to "look closely to discern a pattern," which they can then use to create mathematical models to predict future wind behavior throughout the gorge (Standards for Mathematical Practice, n.d.).

Reason abstractly and quantitatively

Throughout the study of the Columbia River Gorge, NOAA scientists had to collect significant amounts of data in order to create useful models that can be used to understand wind patterns. To do this they had to decontextualize the data they collected and represent it symbolically on a map (Stein, 2018). They had to "attend to the meaning of the quantities, not just how to compute them" in order to create models and explanations of wind patterns and predict future expectations

(Standards for Mathematical Practice, n.d.). This also allows for the data to then be taken and

used in different scientific and mathematical contexts.

Resources

Standards for Mathematical Practice. (n.d.). Retrieved February 07, 2019, from

      http://www.corestandards.org/Math/Practice/

Stein, T. (2018, November 20). New research improves wind forecasts for the renewable energy

      industry. Retrieved February 07, 2019, from

      https://research.noaa.gov/article/ArtMID/587/ArticleID/2396/New-research-improves-

      wind-forecasts-for-the-renewable-energy-industry

The Nature of Science in The Next Generation Science Standards. (2013). *NGSS Public Release*

      *II,*1-7. Retrieved February 7, 2019.