Geophysical Research Abstracts
Vol. 16, EGU2014-2516, 2014
EGU General Assembly 2014

Using Real-Time Oceanic and Atmospheric Data in the Classroom

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While serving as an Einstein Fellow at the National Oceanic and Atmospheric Administration (NOAA), I conducted a research project based on the question, "How can science teachers use real-time oceanic and atmospheric data in their classrooms?" In the United States, new national science standards called the Next Generation Science Standards (NGSS) have been created. These standards provide more emphasis on the analysis of data and on modeling than previous state or national standards. Teachers are more tech-savvy than ever before and the internet provides free access to numerous scientific datasets. These data are useful when teachers have limited time and/or equipment to have students conduct their own experiments. However, the time it takes for practicing educators, even those with a scientific background, to understand how to access these data and use them in a meaningful way is a huge barrier. I wanted to find a way for teachers to make use of this readily available information and to create an online community where educators share best practices and lesson examples.

I began by researching all of the websites hosted by NOAA that provide free, online access to real-time scientific data. I sorted the sites into categories based on their ease of usability for the non-scientist (e.g. teachers and their students). I gave several presentations on the use of real-time data in the classroom to teachers at National Science Teachers Association conferences and gathered teacher feedback on the successes and struggles of using data in the classroom. I began researching best practices for data use with the ultimate goal of creating a framework for matching available datasets from NOAA to the Next Generation Science Standards.

After working on a NOAA research vessel, I developed a lesson using online data from the Alaska Fisheries Science Center Groundfish Survey. The overarching questions for this lesson are "How can pre-existing, large datasets help science students to answer open-ended questions?" and "What can we learn about an ecosystem by analyzing real-time data?" There are several focus questions to guide students through the assignment. In summary, students will examine a large fisheries dataset and develop research questions based on the information. Students will analyze the data and create graphical or other mathematical representations of the data and develop conclusions. Students will also gain practice in making inferences, looking for connections, observing trends (or lack thereof), and drawing conclusions from real scientific data. This type of lesson is highly valuable because unlike the typical classroom experiment where the outcome is often known at the onset, it allows students to see the open-ended nature of scientific investigation, to discover the flaws or holes in a dataset or experimental design, and to develop questions for further investigation.

In order to share these resources with other educators, I have created a collection of oceanic and atmospheric datasets and relevant activities to be posted on the NOAA Education website. I have also created an online community for interested educators by forming a group on the Edmodo website for collaboration and sharing.