

Reading Guide for Visualizing Earth Systems Blogs

<http://svs.gsfc.nasa.gov/ESW2015/>

In celebration of Earth Science Week's theme of Visualizing Earth Systems, NASA scientists, visualizers and others affiliated with NASA Earth science agreed to share their research and expertise in blog posts. Their blogs feature the latest in the creation and scientific utilization of visualizations.

Written for middle and high school student audiences, these blogs are intended for use during Earth Science Week as well as with other related curriculum topics throughout the school year.

Beyond the information they provide, the value of these blogs also lies in the personal stories of scientists engaged in the development of scientific knowledge (a Next Generation Science Standard (NGSS) component under Science and Engineering Practices). In addition, the blogs can be used to illustrate other NGSS components such as the nature of science, crosscutting concepts and to address the connections with the Common Core State Standards (CCSS) for literacy in science and technical subjects.

Below are strategies and questions that incorporate both the NGSS and the CCSS. Note that not every question will work with every blog; some blogs discuss how visualizations were created, and some present scientific research in which visualizations were used. It will be important to pre-read the blog and select a strategy to fit your classroom.

This guide was developed for ESW 2015 by Cassie Soeffing and Elizabeth Burck, Institute for Global Environmental Strategies (IGES), under NASA Cooperative Agreement NNX09AQ09A

Reading Strategies

Write a Twitter Conversation

Rewrite part of the text as a Twitter conversation, using Twitter's 140-character maximum length. Students should work in pairs and enter the tweets in their science journals. This activity emphasizes summarization and elicits deep understanding. Go one step further and Tweet out using Claim Evidence Reasoning (C-E-R) as a guide. Include #hashtags as appropriate.

Reading Response Journal

Use highlighters or sticky notes to annotate new information while reading. This helps students discover original ideas about the text or elaborate on what they have read. This technique is useful for both middle and high school students.

Say Something Starters

After independently reading the blog post (or designated sections of the blog), students take turns "saying something" about what they read. This should be done with a partner or in small groups. (Use table below for starter suggestions. More information can be found in this article on Improving Science Reading Comprehension: <http://tinyurl.com/q4dhas7>)

Say Something Starters					
Question	Clarify	Connect	Predict	Comment	Explain
I don't get this part	Oh, I get it	This reminds me of	I predict that	This is hard because	My understanding is
Why	Let me explain	This is similar to	I wonder if	This is confusing because	The basic idea is
What do you think	Now I understand	The differences are	I think that	I think that	The basic idea is
What is	This makes sense	I have heard of this	The next idea will		
What does this mean	No, I think it means	An example is			

Table 1: Say Something Starters

Discussion Strategies

Discussion Scaffolding

Establish norms for classroom discussion that encourage all students to participate. A few examples of norms include: 1. Anyone can ask a question, 2. Ideas are critiqued but personal attacks are out of bounds, 3. Don't talk over others, and 4. Take time to think before talking.

Claim-Evidence-Reasoning

After reading the blog, C-E-R can be used to shift the focus of an activity towards one of analysis and argument. C-E-R segues to monitor students' visual thinking by providing a framework for them to write explanations. Ask students to write a sentence that states the main idea (claim). Follow this up with specific references to data that support the claim (evidence) and finally, a statement that connects the evidence to the claim (reasoning).

Questions

The questions below were designed to support CCSS Literacy Anchor Standards and relevant portions of the corresponding standards for science and technical subjects.

Answers can be provided in a science journal, on a separate paper, or via class discussion.

- Write a summary of the blog.
- Complete the following sentences:
 - "I wonder..."
 - "I used to think ..., but now I think ..."
 - "I'm confused about..."
 - How does this relate to
 - How does this change the way we think about ...
- What is the "big idea" that the author is conveying?
- What is your take-away message?
- What was the purpose of the visualization(s) that was included in the blog?
- What question or questions was this author trying to answer?
- What conclusion did the author reach?
- What additional information is needed to deepen the investigation or complete the task?
- Was there any evidence that the author of the blog used reasoned judgment based on research findings? That the author used speculation?
- How does the blog illustrate/demonstrate one of the crosscutting concepts listed below?
 - Patterns
 - Cause and effect
 - Structure and function
 - Stability and change

Connection to Common Core

Connection to Common Core		
Grade Level	Connection to Common Core ELA/Literacy	Standard
High School	RST.11.12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
Middle School	RST.6-8.9	Compare and contrast the information experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Table 2: Common Core Connections to ELA/Literacy

Blog Catalog for Earth Science Week 2015

The following blog posts are available at: <http://svs.gsfc.nasa.gov/ESW2015/>. A reading strategy guide for middle to high school is available at <https://www.strategies.org/education/educator-student-resources/>.

Blog Title	Abstract	Key Concepts	Author	Job Title	Reading Level Information
El Niño: Disrupting the Marine Food Web	Exploring El Niño and the interaction of physical oceanography and biology during this event.	Weather Biology Oceanography	Stephanie Schollaert-Uz	Senior Support Scientist at NASA GSFC/GST	<ul style="list-style-type: none"> • Grade Level: 7-8 • Reader's Age: 12-14 • Reading Level: average
Zooming In: Remote Sensing the Earth	Introduction to remote sensing, along with examples of NASA satellites that collect data used in visualizations.	Remote Sensing Environment Satellite image Pixel	Gary Randolph	Training Coordinator, The GLOBE Program	<ul style="list-style-type: none"> • Grade Level: 7-8 • Reader's Age: 12-14 • Reading Level: average
Q&A with NASA Visualizer, Lori Perkins	A NASA visualizer reflects on her journey and shares insights and advice for aspiring Earth scientists and visualizers.	Data, Visualization, Careers	Lori Perkins	Visualizer at NASA GSFC Scientific Visualization Studio	<ul style="list-style-type: none"> • Grade Level: 7-8 • Reader's Age: 12-14 • Reading Level: average
Beyond Graphs: You, Too, Can Be A Data Visualizer!	Using a variety of tools to make sense of data with visualizations.	Data Visualization tools Weather	Kristen Weaver	Education Specialist for the Global Precipitation Measurement Mission at NASA GSFC	<ul style="list-style-type: none"> • Grade Level 7-8 • Reader's Age: 13-15 • Reading Level: fairly difficult
Q&A with Rad-X Project Scientist, Erica Alston	Rad-X is a high-altitude balloon project providing first-time indications of how cosmic rays deposit energy at the top of atmosphere - which produce showers of additional particles that increase the energy deposited where commercial airlines fly.	Aircraft safety Careers Cosmic rays Science applications	Erica Alston	NASA LaRC	<ul style="list-style-type: none"> • Grade Level: 7-8 • Reader's Age: 12-14 • Reading Level: fairly difficult
The Chesapeake Bay in 661 Million Pixels	Using Landsat imagery to create a mosaic of the entire Chesapeake Bay watershed.	Mosaic Electromagnet -ic spectrum Pixels Visible light Infrared wave- lengths	Mike Taylor	Outreach Scientist at NASA GSFC	<ul style="list-style-type: none"> • Grade Level: 9 • Reader's Age: 13-15 • Reading Level: average

Blog Title	Abstract	Key Concepts	Author	Job Title	Reading Level Information
Notes From the Underground	How a hydrologist uses database visualizations to understand processes occurring beneath the land surface.	Hydrology Water table Aquifer	JT Reager	JT Reager, Hydrologist at NASA JPL	<ul style="list-style-type: none"> • Grade Level: 9 • Reader's Age: 13-15 • Reading Level: average
Making Video Games for NASA	An introduction to interactive visualizations that use live satellite data feeds, featuring NASA's Eyes on the Earth app.	Visualizations Data Programming	Kevin Hussey	Manager, NASA JPL	<ul style="list-style-type: none"> • Grade Level: 9 • Reader's Age: 13-15 • Reading Level: average
Garbage Patch Visualization Experiment	Modeling ocean currents, waves and winds to understand the processes that cause debris (using buoy and model data) to flow to certain patches in the ocean.	Buoys Buoy migration Ocean currents	Greg Shirah	Earth Science- Related Visualizations at NASA GSFC Scientific Visualization Studio	<ul style="list-style-type: none"> • Grade Level: 10 • Reader's Age: 14-15 • Reading Level: average
Does What Happens in the Arctic Stay in the Arctic?	How scientific visualizations are used to understand the impacts of climate change in the Arctic, with a specific focus on melting sea ice and Arctic cloud formation.	Cryosphere Climate change Clouds Water cycle	Patrick Taylor	Research Scientist at NASA LaRC	<ul style="list-style-type: none"> • Grade Levels: 10-11 • Reader's Age: 15-17 • Reading Level: fairly difficult
Dust in the Wind	How a visualization showing the dust migration from the Sahara to the Amazon was created using data from NASA's CALIPSO satellite (which measures aerosols in the atmosphere.)	Aerosols Dust cloud Dust flux Climate	Kel Elkins	Visualizer at NASA GSFC Scientific Visualization Studio	<ul style="list-style-type: none"> • Grade Level: 11 • Reader's Age: 15-17 • Reading Level: fairly difficult
Visualizations: A NASA Eye View of Our Earth	Appreciating the value of satellites to generate scientific visualizations that give us a different view of our world, using examples of a hurricane and precipitation.	Aerosols Hurricanes Weather	Dalia Kirschbaum	Research Physical Scientist at NASA GSFC	<ul style="list-style-type: none"> • Grade Level: 12 • Reader's Age: 17-18 • Reading Level: fairly difficult
Airborne in the Arctic	Measuring cloud properties in the Arctic to understand their role and impacts in the Earth's radiation balance and climate now and in the future.	Clouds Radiant energy Sea ice Aerosols	Rich Moore	Research Physical Scientist at NASA LaRC	<ul style="list-style-type: none"> • Grade Level: 12, college • Reader's Age: 17-18+ • Reading Level: difficult

Blog Title	Abstract	Key Concepts	Author	Job Title	Reading Level Information
A 3-D Look at Weather, Clouds and Aerosols	Creating visualizations for atmospheric research, particularly to study the underlying factors that drive weather patterns.	Weather forecasting	Roman Kowch	Staff Research Scientist at NASA LaRC	<ul style="list-style-type: none">• Grade Level: 12, college• Reader's Age: 17-18+• Reading Level: difficult