How to help K-12 teachers teach about climate change

Image from Huffington Post

Len Bloch St. Andrew's Episcopal School Saratoga, CA

Boundary work is difficult

Have to play dual roles

- Teacher
- Scientist



Accountable to multiple communities

- Children demand intelligibility and engagement.
- Scientists demand rigorous accuracy.
- Different **parents** demand different things.
- Administrators want to meet demands of multiple communities including bureaucracies.
- Bureaucracies respond to multiple communities and behave erratically.

Boundary Objects

"The creation and management of boundary objects is key in developing and maintaining coherence across intersecting social worlds." Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39

Susan Leigh Star and James R. Griesemer

Most scientific work is conducted by extremely diverse groups of actors — researchers from different disciplines, amateurs and professionals, humans and animals, functionaries and visionaries. Simply put, scientific work is heterogeneous. At the same time, science requires cooperation — to create common understandings, to ensure reliability across domains and to gather information which retains its integrity across time, space and local contingencies. This creates a 'central tension' in science between divergent viewpoints and the need for generalizable findings. In this paper we examine the development of a natural history research museum as a case in which both heterogeneity and cooperation are central issues for participants. We develop an analytical framework for interpreting our historical material, one which can be applied to studies similarly focused on scientific work in complex institutional settings.

Social Studies of Science (SAGE, London, Newbury Park and New Delhi), Vol. 19 (1989), 387-420

What is 'Climate Change'?

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IPCC

[...] a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings [...]. (p. 3)

UNFCCC

[...] a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. (Article One)

What is 'Climate Change'?

IPCC UNFCCC [...] a change in the state of [...] a change of climate the cli limate Change reters to major changes in temperature, precipitation, or wind patterns for a long period of time identif statistica in the variabili and th extende decades or longer. Climate

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Bureaucracies respond to changing power dynamics and behave erratically.

The phrases "climate change" and "greenhouse effect" appear nowhere in the 1996 National Science Education Standards.



"Global Warming" mentioned once.

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Sort by: Search Rank Page Order		Found on 1 page (
4962.pdf Page 212 1 match are incomplete, such as the or questions surround- ing global	public the results of work. Violations of such norms do occur, but scientists responsible for such violations are cen- sured by their peers.	subjected to a wide variety of confirma- tions and are therefore unlikely to change in the areas in which they have been test- ed. In areas where data or understanding
	tural, and personal beliefs and ways of viewing the world. Science is not sepa- rate from society but rather science is a part of society.	Science distinguishes itself from other ways of knowing and from other bodies of knowledge through the use
	 Science distinguishes itself from other ways of knowing and from other bodies of knowledge through the use of empirical standards.Jogical arguments, and skepti- cism, as scientists strive for the best possi- ble explanations about the natural world. Scientific explanations must meet certain criteria.First and foremost,they must be consistent with experimental and observa- tional evidence about nature and must 	of empirical standards, logical arguments, and skepticism. are incomplete, such as the details of human evolution or questions surround- ing global warming, new data may well lead to changes in current ideas or resolve current conflicts. In situations where information is still fragmentary, it is nor- mal for scientific ideas to be incomplete, but this is also where the opportunity for

"In areas where data or understanding are incomplete, such as the details of human evolution or questions surrounding global warming, new data may well lead to changes in current ideas or resolve current conflicts." (p.201)

NGSS

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MS.Weather and Climate

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HS-ESS3-6 Earth and Human Activity

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HS-ESS3-5 Earth and Human Activity

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MS-ESS3-5 Earth and Human Activity

... Core Ideas ESS3.D: Global Climate Change Human activities, such as the release of ... surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do ...

3.Weather and Climate

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HS-ESS3 Earth and Human Activity

... forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. ... Boundary: Assessment is limited to one example of a climate change and its associated impacts.] HS-ESS3-6. Use a ...

HS-ESS2-4 Earth's Systems

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HS.Human Sustainability

... degradation. (HS-ESS3-4) ESS3.D: Global Climate Change Through computer simulations and other ... degradation. (HS-ESS3-4) ESS3.D: Global Climate Change Through computer simulations and other ...

3-ESS2 Earth's Systems

... to pictographs and bar graphs. Assessment does not include climate change.] 3-ESS2-2. Obtain and combine information ... to pictographs and bar graphs. Assessment does not include climate change.] 3-ESS2-2. Obtain and combine information ...



Human impact on the Earth in Kindergarten

Climate change mentioned (but not tested) in 3rd grade.

What the teachers asked for

- Workshops
- Hands-on lab activities
- Videos
- Age-appropriate reading materials
- Recommended resources
- Locally-relevant educational materials

Workshops

- From a few hours to a few days.
- Close to home or school (not on University campus).
- Many Environmental Science, Meteorology, and Oceanography teachers are trained in biology and "lack background in physical [and Earth] sciences".





Labs

- "Hands-on" and "kinesthetic" activities.
- Do-able within limited blocks of time.
- Low-cost materials, "like paper-towel rolls" (or provide kits that schools can borrow).



Videos

- Short to capture student interest and provide scaffolding for other learning activities.
- Maybe a video that would help students understand how "people can take the same data and make it mean different things".



Reading Materials

 "Age-appropriate readings" that help students stay up-to-date on a changing field.

 Maybe something like "Astrobuddies" (in which astronomy professors agree to answer emails from students).

Word

- 1. Click the File tab, and then click Options.
- 2. Click Proofing.
- Under When correcting spelling and grammar in Word, make sure the Check grammar with spelling check box is selected.
- Select Show readability statistics.

After you enable this feature, open a file that you want to check, and check the spelling. When Outlook or Word finishes checking the spelling and grammar, it displays information about the reading level of the document.

Recommended Resources

Categorize by appropriate age group.

• Help distinguishing legitimate materials from misinformation.

Materials for teachers to educate themselves.



nat are the local consequences of a continued global warming? And what kind of future climate n you expect for you children? Do we expect more extreme events, and will a global warming

Locally Relevant

 Phenology, water cycle, GHG emission data, etc. that students can analyze.

• Labs they can do on site.



Local climate change





	Temperature (°C)	
18	24	30

Thanks to:

The University of Georgia The Family of Ruby Maude Anderson The Family of Del Jones St. Andrew's Episcopal School 5 Unnamed Teachers

Image from Huffington Post





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