DESE and WGBH Partnership for Educational Resources

We've published NEW content to PBS LearningMedia from some of our recent broadcasts, and more resources will be added to these collections soon! Have you watched one of these shows on television or via streaming? Explore the accompanying resources, contextualized for educational use.

Have you already used some of resources, or do you plan to? Tell us your stories at **education@wgbh.org**!

Our *Bringing the Universe to America's Classrooms* resources, Earth and Space Science resources created in collaboration with NASA, have been used extensively during school Covid-19 closures, with over 243,000 users accessing the resources more than 842,000 times. **Trusted content, curriculum alignment, engaging data-driven visualizations, and robust support materials** are all reasons why they have been used so extensively for distance learning. Check out this lesson plan on heat distribution for grades 9-12:

The Ocean and Climate: Heat Redistribution

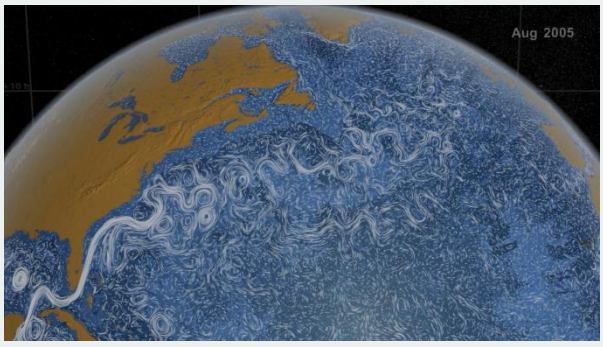
Lesson Objective: Students will be able to relate the connections between unequal heating of Earth's surface and patterns of sea surface temperature, surface winds, and ocean density to ocean currents.

They will communicate how the ocean redistributes heat around the planet by exploring **data maps** and **visualizations**. This lesson also comes with English Learner (EL) supports.

Time Allotment: Two 45-minute sessions

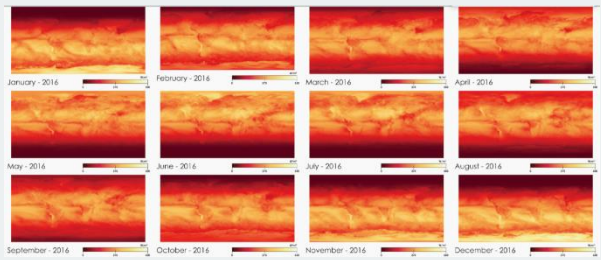
Get the Full Lesson Plan

Included in this Lesson:



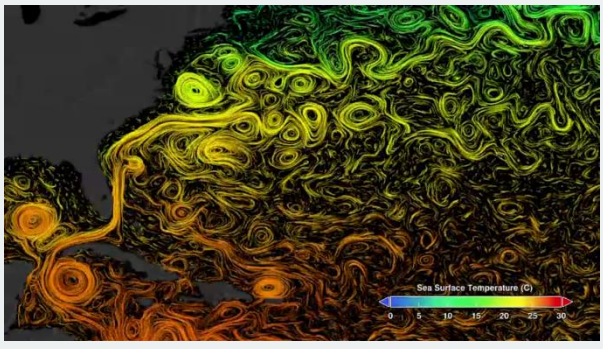
Media Gallery: Perpetual Ocean

Stimulate your students curiosity and interest about ocean circulation as well as its causes and mechanisms. They will view phenomena of ocean flows around the world from different perspectives through these visual depictions.



Interactive: Insolation on Earth

Students will learn about how the amount of solar energy reaching Earth's surface varies across the globe and through time. These maps from NASA show average monthly insolation over the course of a year.

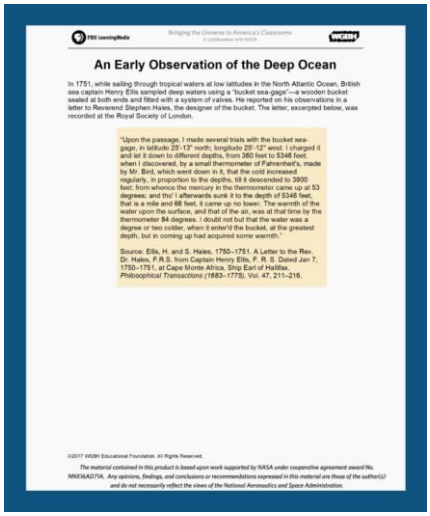


Interactive Lesson: North Atlantic Ocean Circulation

In this interactive lesson, students can explore the ocean's role in redistributing the Sun's energy on Earth. Through NASA data visualizations, they can investigate how various factors interact in the transport of heat.

Sample Support Materials

DESE and WGBH Partnership for Educational Resources



An Early Observation of the Deep Ocean

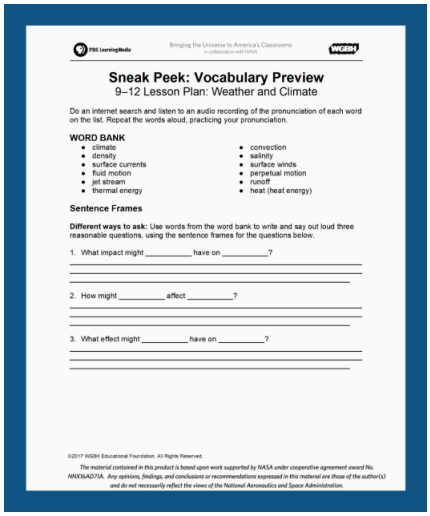
In 1751, while sailing through tropical waters at low latitudes in the North Atlantic Ocean, British sea captain Henry Ellis sampled deep waters using a "bucket sea-gage"—a wooden bucket sealed at both ends and fitted with a system of valves. He reported on his observations in a letter to Reverend Stephen Hales, the designer of the bucket. The letter, excerpted below, was recorded at the Royal Society of London.

"Upon the passage, I made several trials with the bucket sea-gage, in latitude 25°-13" north; longitude 25°-12" west. I charged it and let it down to different depths, from 360 feet to 5346 feet; when I discovered, by a small thermometer of Fahrenheit's, made by Mr. Bird, which went down in it, that the cold increased regularly, in proportion to the depths, till it descended to 3900 feet; from whence the mercury in the thermometer came up at 53 degrees; and tho' I afterwards sunk it to the depth of 5346 feet, that is a mile and 66 feet, it came up no lower. The warmth of the water upon the surface, and that of the air, was at that time by the thermometer 84 degrees. I doubt not but that the water was a degree or two colder, when it enter'd the bucket, at the greatest depth, but in coming up had acquired some warmth."

Source: Ellis, H. and S. Hales, 1750–1751. A Letter to the Rev. Dr. Hales, F.R.S. from Captain Henry Ellis, F. R. S. Dated Jan 7, 1750–1751, at Cape Monte Africa, Ship Earl of Halifax. *Philosophical Transactions (1683–1775)*, Vol. 47, 211–216.

The material contained in this product is based upon work supported by NASA under cooperative agreement award No. NNX16AD75A. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration.

Handout



Sneak Peek: Vocabulary Preview

9–12 Lesson Plan: Weather and Climate

Do an internet search and listen to an audio recording of the pronunciation of each word on the list. Repeat the words aloud, practicing your pronunciation.

WORD BANK

- climate
- density
- surface currents
- fluid motion
- jet stream
- thermal energy
- convection
- salinity
- surface winds
- perpetual motion
- runoff
- heat (heat energy)

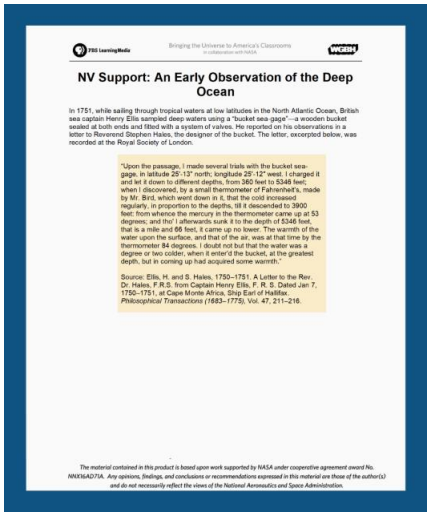
Sentence Frames

Different ways to ask: Use words from the word bank to write and say out loud three reasonable questions, using the sentence frames for the questions below.

1. What impact might _____ have on _____?
2. How might _____ affect _____?
3. What effect might _____ have on _____?

The material contained in this product is based upon work supported by NASA under cooperative agreement award No. NNX16AD71A. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration.

EL Support: Vocabulary



NV Support: An Early Observation of the Deep Ocean

In 1751, while sailing through tropical waters at low latitudes in the North Atlantic Ocean, British sea captain Henry Ellis sampled deep waters using a "bucket sea-gage"—a wooden bucket sealed at both ends and fitted with a system of valves. He reported on his observations in a letter to Reverend Stephen Hales, the designer of the bucket. The letter, excerpted below, was recorded at the Royal Society of London.

"Upon the passage, I made several trials with the bucket sea-gage, in latitude 25°-13" north; longitude 25°-12" west. I charged it and let it down to different depths, from 360 feet to 5346 feet; when I discovered, by a small thermometer of Fahrenheit's, made by Mr. Bird, which went down in it, that the cold increased regularly, in proportion to the depths, till it descended to 3900 feet; from whence the mercury in the thermometer came up at 53 degrees; and tho' I afterwards sunk it to the depth of 5346 feet, that is a mile and 66 feet, it came up no lower. The warmth of the water upon the surface, and that of the air, was at that time by the thermometer 84 degrees. I doubt not but that the water was a degree or two colder, when it enter'd the bucket, at the greatest depth, but in coming up had acquired some warmth."

Source: Ellis, H. and S. Hales, 1750–1751. A Letter to the Rev. Dr. Hales, F.R.S. from Captain Henry Ellis, F. R. S. Dated Jan 7, 1750–1751, at Cape Monte Africa, Ship Earl of Halifax. *Philosophical Transactions (1683–1775)*, Vol. 47, 211–216.

The material contained in this product is based upon work supported by NASA under cooperative agreement award No. NNX16AD71A. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration.

NV Support: An Early Observation of the Deep Ocean

Full Lesson Plan