

Learner-Focused Inquiries



Essential Questions and Activities for Informal Educators

For those of us who work in informal settings (science centers, outdoor schools, zoos, aquariums, etc.), we can agree that the science of climate change, its causes, its effects on all of us, and ways to address it in our homes, communities, and governmental institutions are extremely complex. Since the complexity is difficult to convey in a short time frame, especially with learners you may not see again, we offer links to some activities that can be done in about an hour that will help students understand some component of climate change, or learn ways they can reduce their carbon footprint.

Grades K-2

WEATHER

- What is weather?

This web page lists simple activities you can do outdoors during various kinds of weather: Sunny Walk / Hot Walk / Windy Walk / Rainy Walk / Snow Walk

<http://www.uen.org/Lessonplan/preview?LPid=10665>

RESOURCES

- What do plants need to live?

From Science and Plants for Schools "Plants in Their Natural Environment"

<http://www.saps.org.uk/primary/teaching-resources/88-primary-article-one>

Under 'Download Resources', click on 'SAPS Plants in Their Natural Environment, Part B'

GREENHOUSE EFFECT

- Why is sunlight important to life on Earth?

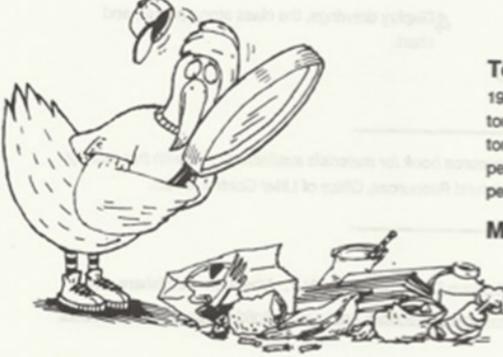
This site contains a simple experiment to demonstrate how rain is formed:

<http://www.weatherwizkids.com/experiments-make-rain.htm>

WHAT WE CAN DO TO ADDRESS THE ISSUE

Activity: "Be a Garbage Detective" teaches how to distinguish between animal and human waste and to better define waste (garbage) and become aware of what happens to it after disposal.

Be a Garbage Detective



- Discuss why garbage is a problem and how to reduce waste.

Teacher Background

1987 garbage facts in Washington State:¹ 5,123,185 tons generated by Washington residents; 3,945,785 tons total waste after recycling; 4.8 pounds garbage per person per day; 2.1 pounds garbage per person per day in the home.

Materials

- Drawing paper
- Crayons
- Scissors
- Paste
- Poster board
- Chart paper

Subject: Science, Art, Language Arts
Grades: K-1
Teaching Time: Two 15-Minute Periods
Focus: Waste Reduction, Landfills, Garbage

Rationale

All living creatures produce some sort of waste. Humans are the most wasteful creatures on earth and often are not concerned about the consequences of human garbage.

Learning Objective

Students will:

- Distinguish the difference between animal and human waste.
- Define waste (garbage) and become aware of what happens to it after disposal.

Pre & Post Test Questions

1. What is garbage?
2. Where does it come from? Where does it go?
3. Why do people create more waste than other animals?
4. Can we reduce the waste we make? How?

Learning Procedure

1 Ask each student to draw two pictures. One picture should be of his/her house. The other should be of a deer's, bear's, or snake's "house." Ask students to look at their pictures and think about garbage. What is garbage? Do animals have to deal with garbage? Why do people have so much more garbage than animals? How do people

¹ Washington State Department of Ecology, *Best Management Practices Analysis of Solid Waste, Vol. 4, Executive Summary*, Olympia, pp. 13-13A.

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Grades 3-5

GREENHOUSE EFFECT

- How does the sun warm the Earth?
- What is the greenhouse effect?

Activity: "Make Sun S'Mores"

Harness the energy of the Sun to make this yummy snack! Students create a solar oven out of a small cardboard box, foil, glue and plastic wrap, then heat a s'more to perfection using the sun's energy. View this activity on NASA's Climate Kids website: <http://climatekids.nasa.gov/smares>.

RESOURCES

- What are natural resources, and how do we use them?

Activity (web-based, interactive): "Where Does Energy Come From?" Students can click on the 'stars' that show where energy comes from for homes, humans, trees and industrial use. Go to: http://www.energystar.gov/index.cfm?c=kids.kids_index, click on "You Can Make Big Changes, Find Out How", then "Your Planet Needs You" on the bottom of the page, then on "Where Does Energy Come From?"

- Are some of these natural resources renewable? How?

Short activity (web-based, interactive): "What Are the Types of Energy?" Shows renewable energy (solar, wind, water, plants) and non-renewable energy (oil, coal, natural gas, nuclear) Go to: http://www.energystar.gov/index.cfm?c=kids.kids_index, click on "You Can Make Big Changes, Find Out How", then "Your Planet Needs You" on the bottom of the page, then on "Types of Energy".

- What are some ways we can conserve (or use less of) our natural resources, such as: water, soil, food, coal, oil, gasoline, etc.?

Activity (interactive, web-based): "You Can Make Big Changes in Your Own Bedroom" Students can click on the 'stars' on various items in their room to see how they can conserve energy. Go to: http://www.energystar.gov/index.cfm?c=kids.kids_index, click on "You Can Make Big Changes, Find Out How".

CLIMATE CHANGE

- What are some steps that we can take to reduce human impact on climate change?

Activity: "Extra Fancy Duds" from *A-way With Waste* from the Washington State Department of Ecology. Students will learn how to identify types of packaging from natural to recyclable to non-recyclable and to identify the ways that we're influenced to buy packaged products.

Extra Fancy Duds



Subject: Math, Science, Social Studies
Grades: K-5
Teaching Time: Two 15-Minute Periods
Focus: Packaging, Consumer Awareness, Waste Reduction, Biodegradation

Teacher Background
Containers and packaging facts: Containers and packaging totaled 42.7 million tons in the municipal solid waste stream in 1986, or 30.3 percent of total municipal waste. The component by materials: glass, 7.6 percent; paper and paperboard, 14.5 percent; steel, 1.9 percent; plastics, 4 percent; aluminum 0.7 percent; and wood, 1.5 percent.¹

Rationale
Packaging influences what people buy. People have choices and can reduce the amount of garbage (solid waste) they generate by making thoughtful choices when they buy packaged products.

Materials

- Two apples
- Plastic ribbon

Learning Objective
Students will:

- Be able to identify types of packaging and the ways that they are influenced to buy packaged products.

Pre & Post Text Questions

1. What does "biodegradable" mean? (See Glossary)
2. Why do we need packaging?
3. What is plastic made of?

¹ Franklin Associates LTD., *Characterization of Municipal Solid Waste in the United States, 1960 to 2000: Update 1988*, Prairie Village, KS: Franklin Associates LTD., pp. 15-16.

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GREENHOUSE EFFECT

- What are greenhouse gases, and how are they related to climate change?

A computer animation of the Greenhouse Effect (2 minutes) found on YouTube under "Greenhouse Gases: Climate Change, Lines of Evidence: Chapter 3" <http://www.youtube.com/watch?v=3JX-ioSmNW8>. Also, use the following interactive, web-based activity: Greenhouse Gas & Greenhouse Effect Simulation <http://phet.colorado.edu/en/simulation/greenhouse>.

CLIMATE CHANGE

- What human activities are likely contributing to climate change?

Activity: Through this web-based, interactive activity, students can calculate their carbon footprint on this page designed for middle and high school students: <http://footprint.stanford.edu/calculate.html>.

- What are local communities trying to do about climate change, and what are countries around the world trying to do about climate change?

Activity: "Climate Change Card Games" from *Climate Choices / Children's Voices* in the United Kingdom found at: <http://www.climatechoices.org.uk/pages/activities0.htm#p1>. This activity has a total of 32 cards. The cards cover 8 different countries (Bangladesh, Kenya, Nepal, Peru, Sri Lanka, Sudan, Zimbabwe, UK, USA) and each country card shows:

- The effects of climate change in the country
- A solution to help the people tackle the effects of climate change
- A personal story
- A map of the world with the country marked on it

The cards can be found at: http://www.climatechoices.org.uk/docs/card_games_cards.pdf

- Who is responsible for climate change?

Activity: (from "Understanding Climate Change" by Laura Tucker, ©2012; for complete curriculum, contact: ltucker@berkeley.edu).

- Have students work in groups of 4-6.
- Use the following graphs of temperature, carbon dioxide data, and human population growth to discuss the statements below.
- They should decide individually if they agree or disagree with each statement and write their evidence to support their claim. Students

take turns stating whether they agree or disagree with each statement. They should cite evidence from the graphs to support their claims.

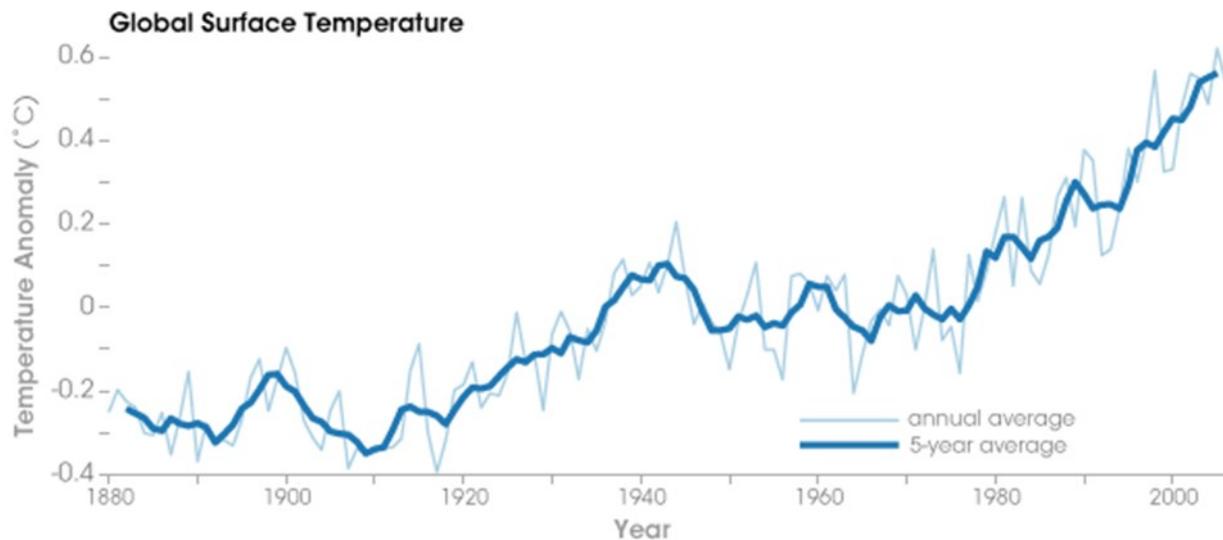
- After all students have taken a turn, have the group try to come to a conclusion for each statement. In a debriefing of the activity, have each group share their results with the class.

Do you agree or disagree with each statement?

1. The earth is warming, but it is a normal, cyclical pattern with no cause for concern.
2. There is a direct correlation between human beings and the increase of CO₂ in the atmosphere.

Graph 1: Global Surface Temperature

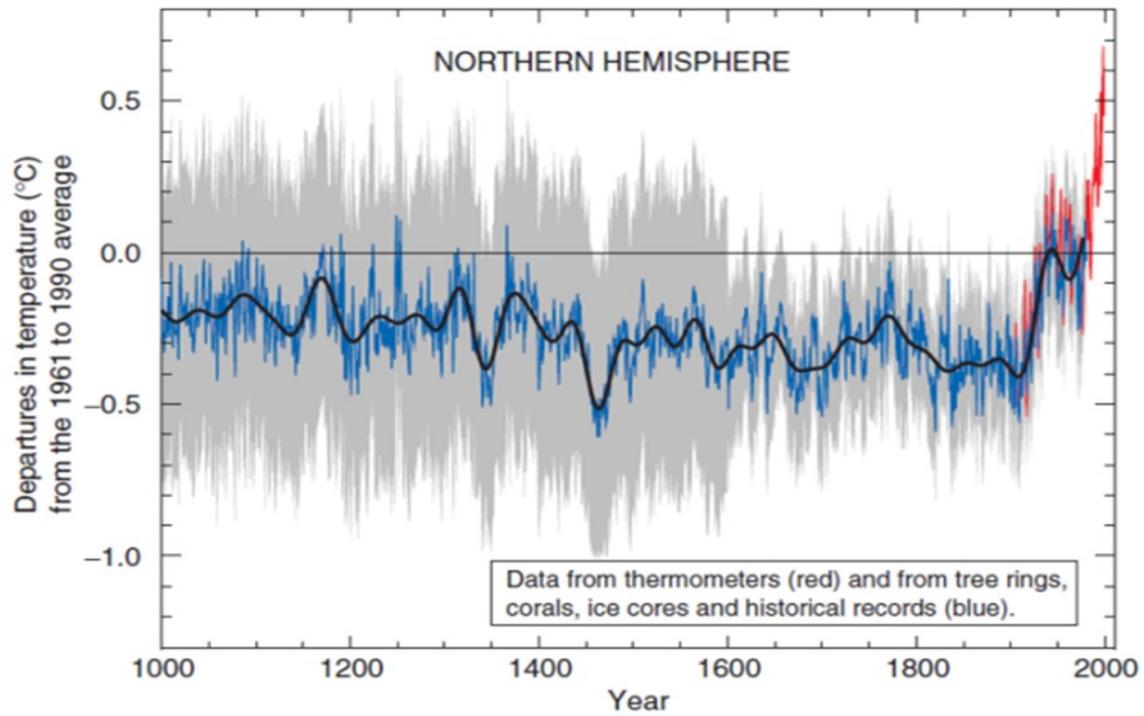
The graph shows one degree Fahrenheit rise in the temperature record of the entire Earth's surface during the 20th century.



Source: earthobservatory .nasa.gov

Graph 2: Temperatures in the Northern Hemisphere

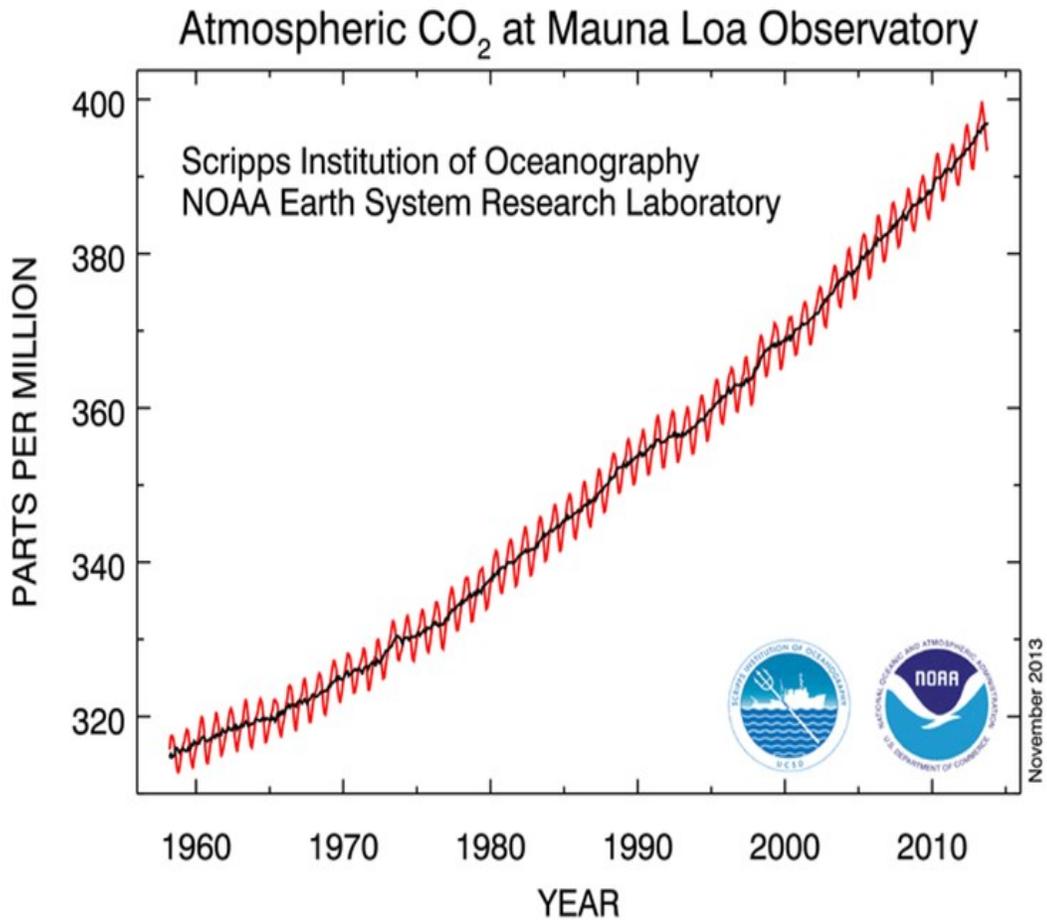
The graph shows 1,000 years of temperature in the northern hemisphere.



Source: IPCC Third Assessment Report, *Climate Change 2001*

Graph 3: Carbon Dioxide Measurements on Mauna Loa

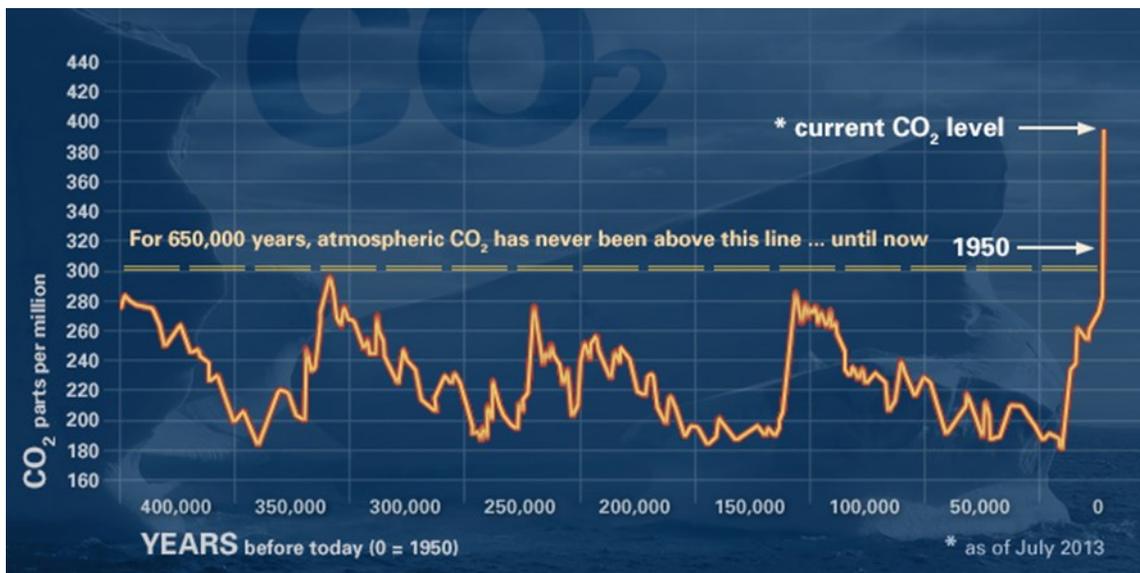
The carbon dioxide data (red curve) on Mauna Loa constitute the longest record of direct measurements of CO₂ in the atmosphere. C. David Keeling of the Scripps Institution of Oceanography started the measurements in March, 1958. NOAA started its own carbon dioxide measurements in May of 1974. This unbroken record of the carbon dioxide content of the atmosphere shows how it's gone up from around 315 parts per million in 1958 to around 400 parts per million on average today.



Source: Scripps Institution of Oceanography, National Oceanic and Atmosphere Administration Earth System Research Laboratory.

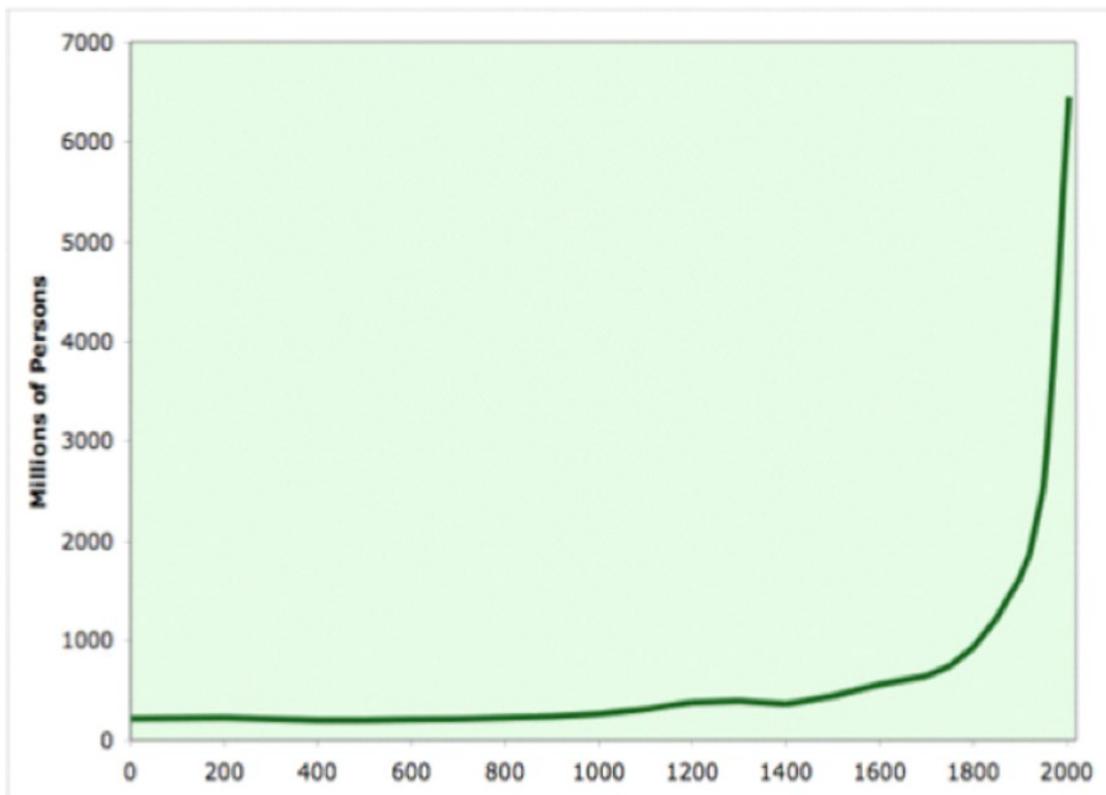
Graph 4: Measurements of Carbon Dioxide from Ice Cores and Other Sources

This graph, based on the comparison of atmospheric samples contained in ice cores and more recent direct measurements, provides evidence that atmospheric CO₂ has increased since the Industrial Revolution.



Source: National Oceanic and Atmosphere Administration

Graph 5: The Growth of the World Population since AD 0



Source: U.S. Census Bureau. The graph before 1900 is an average of the McEvedy/Jones and the Biraben estimates. After 1900, the UN data is used.