



Environmental Character Education



Curriculum Resources

Kindness

High School - December, 2006

Dear Teachers:

Kindness is described as being helpful, thoughtful, caring, compassionate and considerate. December is the perfect month to show **kindness** to friends, neighbors, and the community. It is also important to remember that our roles include being **kind** to the environment in which we live, including the animals, plants, and natural resources on our planet.

Clearing the Air: Exploring Emissions and Substances that Influence Global Climate Change

Sunshine State Standards: SC.H.1.4, SC.H.3.4, SC.G.1.4, SC.G.2.4, SS.B.2.4, LA.A.2.4, LA.B.1.4, LA.B.2.4

In this lesson, students investigate a variety of emissions that contribute to global warming. As presenters at a mock international summit, students prepare recommendations for reversing the global warming trend.

Objectives:

Students will:

- Brainstorm a list of ways both residents and institutions can help protect and improve air quality. Broward County's Air Quality web site (www.broward.org/air) and the U.S. EPA web site (www.epa.gov/air) are good resources.
- Explore the debate over which emissions should be tackled first to solve the global warming problem by reading and discussing, "Debate Rises Over a Quick(er) Climate Fix."
www.nytimes.com/learning/teachers/featured_articles/20001003tuesday.html
- Research an emission that contributes to global warming and describe how it affects climate change, and how people can work to reduce this emission in the future.
- Present their findings in the form of a mock international summit.
- Compose a reflective essay making recommendations for the best short and long-term solutions to emissions reduction.



Resources / Materials

- student journals or lab notebooks
- paper
- pens/pencils
- classroom blackboard
- reference materials containing information about global warming and related emissions (science textbooks, resource materials about global warming and pollution, computers with Internet access).
- copies of "Debate Rises Over a Quick(er) Climate Fix" (one per student -- go to the above NY Times link or contact airoutreach@broward.org for copies.)

Activities / Procedures:

1. Have students respond to the following in their journals (have the following questions written on the board prior to class):

- What can residents do to protect and improve our air quality?
- What can governments and institutions do to protect and improve our air quality?

After five to ten minutes, have students share and discuss their responses. Record the items students suggest in two columns on the board.

2. Divide students into research groups. Each group will work to research one emission contributing to global warming (methane, black carbon (soot), carbon dioxide, and nitrogen oxide/hydrocarbons and how they are related to ozone destruction). In preparation for a mock international summit on global warming, students use the following questions as research guides:

- What is this emission? What is its structure on the molecular level?
- How is this emission formed?
- Is this emission always harmful? What makes it harmful to air quality and global climate change?
- What are the sources that place this emission into the atmosphere?
- How does the emission of this gas or particle vary around the world (from country to country or within a country)?
- What are the recommended "next steps" needed to tackle the global warming problems caused by this emission?
- Which steps are considered long term and which are considered short term?
- How does a country's infrastructure, technology, economy, and politics impact the long-term and short-term decisions about controlling the release of this emission?

The National Oceanic and Atmospheric Administration and Greenpeace maintain a web site of frequently asked questions about global warming. These are good starting points on the Internet for student research: www.ncdc.noaa.gov/ol/climate/globalwarming.html and www.greenpeace.org/~climate/climatefaq.html.

3. Wrap-up/Homework: As the mock international global warming summit convenes in class, students present their findings and advocate for why their emission should or should not be the one tackled first as a means of slowing global warming. For homework, students compose a reflective essay discussing what they think are the most viable solutions (both long-term and short-term) for reversing the trend of global warming. Students consider all evidence presented at the summit along with the knowledge gained through their own research as they weigh the pros and cons of tackling each emission.

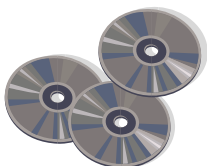
Further Questions for Discussion:

- What is global warming?
- What causes global warming?
- What is the relationship between industrialization and greenhouse gas emissions?
- How might the level of industrial development in a country affect the ways in which it can limit the emission of greenhouse gases?
- What types of greenhouse ingredients do you think should be tackled first in order to reverse the trend in global warming?
- What other human activities contribute to global warming?
- What solutions are already in place to reduce the amount of greenhouse gases in the atmosphere?
- What health issues are related to the depletion of the ozone layer?

Extension Activities:

1. Create a glossary of terms related to global warming. Include definitions/explanations that are important to the understanding and explanation of global warming and how emissions add to the greenhouse effect.
2. Create a molecular model of ozone (2 or 3-dimensional depiction) and demonstrate how ozone interacts with other emissions such as nitrogen oxides and hydrocarbons to cause what is known as the "greenhouse effect." Include a written explanation along with your diagram or model. Explore how chlorides break apart oxygen molecules.
3. Research the latest advances in electric and hybrid (electric and gas) powered automobiles. How do these automobiles work? Who is currently manufacturing them? How do they improve air quality? Create a "how it works" poster detailing how these vehicles work.
4. Research modern technological innovations that have helped reduced our dependence on polluting fossil fuels. Explore alternative energy sources, discussing their relative costs and environmental impacts. What are the pros and cons of these alternative energy sources?

Source: www.nytimes.com/learning/teachers/lessons/20001003tuesday.html?searchpv=learning_lessons



The *Environmental Resources for Teachers* CD is now available at no charge!

Contact the Air Quality Division today for your copy!!!
954-519-1482 or airoutreach@broward.org

If you have any questions regarding these activities or have any comments, call 954-519-1220 or e-mail airoutreach@broward.org. You can also visit our web site at www.broward.org/kids and click on the Environmental Kids Club button.