



Climate Change and Air Pollution

Grades 9 - 12

Length of Lesson:

One to two class periods

Standards:

Georgia Science Standards:

- SEV2. Students will demonstrate an understanding that the Earth is one interconnected system.
- SEV3. Students will describe stability and change in ecosystems.
- SEV4. Students will understand and describe availability, allocation, and conservation of energy and other resources.
- SEV5. Students will recognize that human beings are part of the global ecosystem and will evaluate the effects of human activities and technology on ecosystems.
- SEC5. Students will assess the impact of human activities on the natural world, and research how ecological theory can address current issues facing our society, locally and globally.
- SM5 Students will differentiate the climates of Earth, how climate changes through time, and the theories regarding current climate change.

<https://www.georgiastandards.org/Standards/Pages/BrowseStandards/ScienceStandards9-12.aspx>

National Science Standards Addressed:

- Content Standard: NS.9-12.1 Science as Inquiry
- Content Standard: NS.9-12.5 Science and Technology
- Content Standard: NS. 9-12.6 Personal and Social Perspectives

National Technology Standards Addressed:

- Content Standard: NT.K-12.4 Technology Communication Tools
- Content Standard: NT.K-12.5 Technology Research Tools
- Content Standard: NT.k-12.6 Technology Problem-Solving And Decision-Making Tools

National Language Arts Standards Addressed:

- Content Standard: NL-ENG.K-12.4 Communication Skills
- Content Standard: NL-ENG.K-12.5 Communication Strategies

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- Content Standard: NL-ENG.K-12.12 Applying Language Skills
<http://www.education-world.com/standards/national/index.shtml>

North American Association for Environmental Education (NAAEE): Guidelines for Learning Addressed:

- Strand 1 Questioning, Analysis, and Interpretation Skills
- Strand 2 Knowledge of Environmental Processes and Systems
- Strand 3 Skills for Understanding and Addressing Environmental Issues
- Strand 4 Personal and Civic Responsibility
<http://www.naaee.org/programs-and-initiatives/guidelines-for-excellence/materials-guidelines/learner-guidelines-strands>

Focus:

This lesson focuses on climate change - what it is, how we know it is happening, and the causes.

Description:

Students will gain background knowledge regarding the effect of air pollution on climate change by viewing a PowerPoint presentation and participating in an activity to reinforce learning.

This lesson is appropriate for Environmental Science, Earth Science, Biology, and Chemistry classes as an introduction to climate change and air pollution, as well as for classes that consider current issues.

Materials:

- PowerPoint presentation "*Climate Change and Our Atmosphere.*"
- Internet access
- "Personal Solutions" worksheet

Vocabulary:

- Climate change
- Global warming
- Greenhouse gases
- Greenhouse effect
- Troposphere
- Stratosphere
- CO₂
- Methane

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- Nitrous Oxides (NO_x)
- Ozone
- Ozone Depletion
- Food chain/web
- Ultraviolet (UV) rays
- DNA
- Chlorofluorocarbon (CFC)
- Catalyst

Background/ References:

- View the PowerPoint presentation prior to showing it to students.
- Visit the following links for more information on climate change and air pollution:
 - <http://epa.gov/climatechange/basicinfo.html>
 - <http://www.epa.gov/climatechange/fq/science.html>
 - <http://www.epa.gov/ozone/strathome.html>
 - http://ozone.unep.org/Assessment_Panels/EEAP/eeap-report2006.pdf
 - <http://www.ipcc.ch/> IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Procedure:

- Complete the Warm-Up to introduce lesson.
- Show the "*Climate Change and Our Atmosphere*" PowerPoint presentation.
- Complete Activity Two and Activity Three if time permits.

Warm-up:

- Write on the board, "*Climate Change and Our Atmosphere.*"
- Ask students to list some of the points they already know about climate change.

Activity One:

- Students view PowerPoint presentation "*Climate Change and Our Atmosphere.*"

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Activity Two:

- Complete the attached "Personal Solutions" worksheet.

Activity Three:

- Calculate your family's CO₂ emissions and potential savings using the emissions calculator at the following site:
http://epa.gov/climatechange/emissions/ind_calculator2.html#_c=theBasics&p=reduceOnTheRoad&m=calc_currentEmissions

Extension: Cooperative learning exercise

- Visit the following link for the IPCC Report for Policymakers:
http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_SPM.pdf
- Using the "Summary for Policymakers" report of Working Group 1 of the Intergovernmental Panel on Climate Change (IPCC), divide students into groups to read and report to the class on each of the following sections:
 - Human and Natural Drivers of Climate Change
 - Direct Observations of Recent Climate Change
 - A Palaeoclimatic Perspective
 - Understanding and Attributing Climate Change
 - Projections of Future Changes in Climate (omit 'Emissions Scenarios')
- Discuss the following questions with the class.
 - Is climate change "real"?
 - Is there accurate science behind the observations and predictions?
 - What are some ways to limit the causes of climate change?
 - Are the changes that can be made enough to eliminate further climate change?
 - What might the world be like if we don't make changes?
 - What are YOU going to do to help solve this problem?

Assessment:

- Participation in class discussion and class activities
- Completion of activity

Follow-Up:

After you have taught this lesson plan, please let us know what you think by clicking on Feedback Form at

<http://www.cleanaircampaign.org/Kids-Schools/Lesson-Plans>. The

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information you provide is invaluable in helping us strengthen these lesson plans, align them with your learning objectives, and create new materials for your students. Thanks for your help!

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