



Investigation 1.3: Climate & Climate Change

Objectives:

Upon completion of this activity, students will:

- Understand and be able to communicate explanations about the concepts of climate, climate change and the greenhouse effect.
- Identify and utilize various methods for studying climate change including scientific method and local knowledge, as well as, recognize that people from many different cultures have and continue to make contributions to science and technology.
- Identify various types of technology used for scientific research and understand that technology enhances accuracy and allows scientists to analyze and quantify results of investigations.
- Understand Arctic climate is affected by interactions among earth's systems (atmosphere, biosphere, geosphere and hydrosphere).
- Recognize that the atmosphere is a mixture of nitrogen, oxygen, and trace gases amongst other things.
- Understand that climate change has impacts for flora and fauna, including humans because all organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment. Extinction of a species occurs when the environment changes and the adaptive characteristics of the organism are insufficient to allow for its survival.

Method(s):

- Group discussion/introduction and readings.
- Individual students practice note-taking, critical thinking skills during a practice interview.
- Students reflect, respond and brainstorm in their science journals.

Background:

Note: Have available as a transparency, a handout, in student journal or online.

- What are characteristics of the arctic environment?
- What are Earth's systems? – Atmosphere section
- What is Climate?
- Climate Change and the Arctic
- Global Warming
- Greenhouse Effect
- Greenhouse Gases
- How do we study and predict global climate change?
- What are some technologies we have available to assist in our studies?
- What are possible consequences of climate change?

Materials:

- If available, video “The Science of Change” Natural Resources Canada
- NOAA/NASA/EPA factsheet, “How Do We Take the Earth’s Temperature?”
- Reading: “Question & Answer/Classroom Demonstration on the Greenhouse Effect and Global Warming: (Optional, materials for demonstration for Greenhouse Effect Demo. 2 large glass jars, _” soil in each jar, 2 thermometers, light sources & 150 watt bulb.)
- Reading : “Community-based Monitoring Program, 2000-2001: Inuvialuit of Aklavik, Northwest Territory, Canada”

Assessment:

- Personal Communication of understanding during class discussions.
- Constructed Response – Written response to readings.

Procedures:

1. Using the definitions provided in the background material, ask students to summarize the local weather conditions. If possible, have long-term climatic data for your area for students to analyze. If this is not available, ask student to summarize the local climate based on their knowledge and observations.
2. Keep in mind that climate is the long-term average of a region’s weather. Now, review the characteristics of the Arctic climate (see background).
3. What is climate change? If available, watch the video “The Science of Change” Natural Resources Canada. As a class read aloud, “Climate Change and the Arctic” (see background).
4. How can we study climate change? One way is the use of the scientific method and the other is the use of local knowledge or traditional Native knowledge. First let’s look at some methods used in scientific research.
5. What technology do we have available to assist in scientific research? Including technology that enhances accuracy and that which allows scientists to analyze and quantify results of climate change investigations? Allow student the opportunity to share their ideas. Then briefly review the NOAA/NASA/EPA factsheet, “How Do We Take the Earth’s Temperature?” Concentrating on the “Ice Cores” section and the “What do these methods tell us?” section. Briefly discuss the use of computer technology.
6. What is an example of scientific inquiry of climate change? Measuring the amount of carbon dioxide in the atmosphere. Use the background information provided about the atmosphere discuss its components. If desired, model graphing techniques or have students create graphs using the components of the atmosphere percentages provided.
7. We study the amount of carbon dioxide in the atmosphere because it is tied to another phenomenon, Greenhouse Effect. [“Question & Answer/Classroom Demonstration on the Greenhouse Effect and Global Warming”](#) from the American Museum of Natural History, to facilitate a discussion about these concepts. (Download [Greenhousegas.PDF](#)). Complete any of the optional demonstrations they include. (See extension section “Global Warming: Understanding the Forecast”)
8. Climate change can also be understood in terms of “local knowledge”. Read the background section on local knowledge. Discuss this with students. What they can learn from elders, what to ask, what to listen for, what types of information are valuable as an indicator of climate change, etc.?
9. Read aloud, [“Community-based Monitoring Program, 2000-2001: Inuvialuit of Aklavik, Northwest Territory, Canada”](#). (Download [Localknow.PDF](#)) Before beginning, tell

- students they will practice note-taking skills while listening, as if it they were responses from a panel. If possible model some techniques they could use before you begin.
10. Regardless of the method used to study climate change, the reality is that global warming will have impacts at the level of the physical environment and for flora and fauna.
 11. Introduce the idea that all organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment. Extinction of a species occurs when the environment changes and the adaptive characteristics of the organism are insufficient to allow for its survival.
 12. Prompt students by giving a few examples. Then, allow students to work individually or cooperatively to write ideas in their journal (see challenge question). Brainstorm a list of physical consequences of global warming (i.e. things happening in the oceans, atmosphere, on land, etc.)? How do these things impact flora and fauna (including humans)?

Extensions:

- Biosphere 2 – Carbon Balancing Act. This activity takes advance preparation, so plan ahead. It is an excellent demonstration of the carbon cycle and how human activity is increasing carbon dioxide levels. <http://www.bio2.edu>
- Weather and Climate / Climate Statistics Lesson at: <http://www.arm.gov/docs/education/lessons/act2.3.html>
- Global Warming: Understanding the Forecast (Curriculum from Museum of Natural History: Background Information, Lessons, Resources List, etc.) http://www.environmentaldefense.org/documents/395_gwtrm.pdf

Resources:

National Science Teachers Association. (1996). *Forecasting the Future – Exploring evidence for global climate change*.