Biomes: Arctic Changes

Grade Level: 6-8	**Subject:** Ecology	**Duration:** Three class periods

Objectives

Students will

- learn the geography of Arctic and Roald Amundsen's route through the Northwest Passage;
- define global warming and discuss its effect on the Arctic;
- discuss the experiences of a modern research expedition; and
- write a journal that describes the impact of global warming.

Materials

- Poster board and pen
- Paper and pencils

Procedures

1. After watching the video *Biomes: Arctic Changes*, locate the Arctic on a world map. Show the class the route that explorer Roald Amundsen followed from 1903 to 1906; he wanted wanted to find a shorter trade route to Asia. (See the Web site www.marine.fm/en/nwpmapen.htm.) This was the first expedition to cross the Northwest Passage, an Arctic route connecting the Atlantic and Pacific Oceans. Almost 100 years later, biologist Jean Lemire lead a team on Amundsen's route. What was the purpose of this expedition? (to study global warming)

2. Ask the class to define global warming. (The gradual increase of the temperature of earth's lower atmosphere due to the increase in greenhouse gases, including carbon dioxide and methane.) How do humans contribute to global warming? (They burn fossil fuels for cars and energy.) Explain that the Arctic is one place most affected by global warming. How is global warming changing Arctic geography? (The ice caps and permafrost are melting, eroding coastlines.) How do melting icebergs affect Europe's climate? (Europe is warmed by the Gulf Stream, which moves tropical water north. Melting icebergs release freshwater into the Gulf Stream, slowing it down, which leads to lower temperatures.)

3. On the world map review Lemire's general route, which began in the Magdalen Islands in the Gulf of St. Lawrence, in Quebec, Canada. (Follow the expedition's route on an interactive map at this Web site: http://www.nfb.ca/sedna/arcticmission/ma_accueil/index.html.) Have students name important events and memorable sights encountered by the research expedition. Write their comments on the board. These are examples:

    - Leaving friends and family at the Magdalen Islands
    - Sighting fog and a surprising number of ice caps off the coast of the Labrador Sea
    - Dead polar bear on the ice of Hudson Bay
    - Walruses unable to ride ice blocks to reach feeding sites
    - Inuit diving for starfish
    - Large waves in the Hudson Strait (no more ice to stop the waves)
    - Getting stuck in the ice in the Baffin Islands
    - Bowhead whales in Isabella Bay
    - Getting stuck in ice in Bellot Strait

- Tundra and melting permafrost around the Beaufort Sea
- Melting permafrost in the tundra broken away from the coastline
- Polar bear swimming to the ship in the Bering Strait
- Crossing through the Bering Strait between the United States and Russia
- Sighting the fastest-melting glaciers in the world in Alaska
- Seeing cities and smokestacks on Vancouver Island

4. Have students imagine they are scientists on Lemire's research expedition, and have them write a one-page journal entry describing one experience. They may use the list above or make up others. Their entry should address the following questions:

    - What did you see or experience today?
    - Where were you on the route?
    - How did this event or sight reflect the impact of global warming?
    - Describe your emotion; were you surprised, excited, sad, angry, anxious?
    - How was your experience different from Amundsen's?
    - If you were to make this expedition in 50 years, what changes would you expect to see?

5. Journals should include at least one picture, such as a sketch or a map marking their location in the route.

6. Collect the journal entries and put them in order, following the chronology of the expedition route. Add an "Arctic Journal" cover page to create a class journal of the expedition. Then photocopy pages to make a copy for every student.

Evaluation

Use the following three-point rubric to evaluate students' work during this lesson.

- **Three points:** Students were active in class discussions; showed a strong understanding of the geography of the Arctic and global warming; cited several images and events from the video; and created a clear, complete journal entry that answered all questions and included at least one picture.
- **Two points:** Students participated in class discussions; showed satisfactory understanding of the geography of the Arctic and global warming; cited some images and events from the video; created an adequate journal entry that answered most of the questions and included at least one picture.
- **One point:** Students participated minimally in class discussions; showed minimal understanding of the geography of the Arctic and global warming; cited few or no images and events from the video; created an incomplete journal entry that answered few or no questions and was sloppy or lacking a picture.

Vocabulary

Arctic
Definition: region around the North Pole, including the Arctic Ocean and parts of North America, Asia, and Europe
Context: Global warming has had a devastating impact on wildlife in the Arctic.

global warming
Definition: gradual increase of the temperature of Earth's lower atmosphere
Context: Many scientists believe that an increase in carbon dioxide, methane, and other greenhouse gases causes global warming.

Northwest Passage
Definition: water route through Arctic islands that connects the Atlantic and Pacific Oceans
Context: The explorer Roald Amundsen lead the first expedition through the Northwest Passage between 1903 to 1906.

permafrost
Definition: soil or rock in polar regions that remains frozen year-round
Context: Global warming is causing some permafrost to melt and erode coastlines.

Academic Standards

Science
The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K–12. To view the standards, visit http://books.nap.edu.

This lesson plan addresses the following national standards:

- Science in Personal and Social Perspectives: Natural hazards; Populations, resources and environments; Science and technology in society
- Science and Technology: Understandings about science and technology
- Life Science: Populations and ecosystems; Diversity and adaptations of organisms

Social Studies
The National Council for the Social Studies (NCSS) has developed national standards to provide guidelines for teaching social studies. To become a member of the NCSS, or to view the standards online, go to http://www.socialstudies.org.

This lesson plan addresses the following thematic standards:

- People, Places, and Environments
- Science, Technology, and Society

Credit

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