

**DRAFT**

Climate Changing Over Time Lesson Plan  
"Peter Kilabuck, Voices from the North"

**Grade/ Course:** Science 10 - Unit D: Energy Flow in Global Systems

**Lesson Length:**

**Curriculum Connections:** Alberta Curriculum

**GLO 1:** Describe how the relationships among input solar energy, output terrestrial energy and energy flow within the biosphere affect the lives of humans and other species

*I can...*

**1.1)** explain how climate affects the lives of people and other species, and explain the need to investigate climate change.

**GLO 3:** Relate climate to the characteristics of the world's major biomes, and compare biomes in different regions of the world

*I can...*

**3.4)** identify the potential effects of climate change on environmentally sensitive biomes (e.g., impact of a reduction in the Arctic ice pack on local species and on Aboriginal societies that rely on traditional lifestyles)

**Background:**

The Canadian Wildlife Federation (CWF) has developed The Voices from the North video series as a resource to be used in both southern and northern classrooms. This particular lesson plan has been developed to be used in conjunction with the Climate Changing Over Time video. This video can be accessed at <http://youtu.be/BeKI7IJdNGg>.

**Focusing Question:** Are there relationships between solar energy, global energy transfer processes, climate and biomes?

**1. Introduction Video: Peter Kilabuck, Voices from the North (10 minutes)**

- Prior to watching the vignette, tell the students that they are going to watch a video about someone from Nunavut speaking of some of the changes that are happening in the Arctic.
- Peter Kilabuck is from a community in Nunavut called Pangnirtung. Ask students to locate Nunavut on the map. Have the students locate Pangnirtung.
- Ask the students what they have heard in the news, from their parents, friends or other sources, about what is happening in the Arctic as a result of climate change.
- Watch the vignette from The Canadian Wildlife Federation Voices of the North Series, "Peter Kilabuck, Climate Changing Over Time."
- The video can be accessed at: <http://youtu.be/BeKI7IJdNGg>

- Have students watch the video clip again this time with the following questions in mind (post the following questions on the board):
  - What are some of the changes to the sea ice that have been observed by people in Nunavut? (*Ice forming later in the year and melting sooner*)
  - How do changes in sea ice affect people in Nunavut? (*Less opportunity for travel across the sea ice, less opportunity to hunt on sea ice, warming temperatures, etc.*)
  - Changes in Arctic sea ice affect people all over the world (globally)? (*Globally warming of the oceans causes overall warming of the global climate*)

## 2. Group Discussion: (10 minutes)

As a class, discuss the video with special attention to the posted questions on the board.

*Additional Question for Class Discussion:*

- Peter Kilabuck mentions in the end of the video that Inuit traditional knowledge has been traditionally communicated orally, unlike western science which is generally written in books. What difficulties could this pose in trying to document long term changes in climate? (*Elders passing away before they pass on the information. Difficulty in translating information from Inuktitut or Inuinnaqtun into English*)

## 3. Activity: Why is Sea Ice Important? (30 minutes)

- Let the students know that they will be participating in an experiment to better understand the importance of sea ice in the arctic.
- Explain to the students the concept of Albedo. Albedo is the amount of sunlight that is reflected back into space.
- Ask students to imagine a hot summer's day. Ask which shirt they would rather wear, a black shirt or a white shirt. Why? The colour of a surface affects the amount of sunlight that is absorbed by an object. (*The darker and duller an object, the more light it will absorb, and the hotter you will be. The lighter and shinier an object, the more light it will reflect, and the cooler you will be.*)
- Explain that they will be conducting an experiment today to explore the affects of albedo on temperature. They will be using a variety of materials to measure how the different materials will affect albedo (reflection).
- You will select from a variety of different materials (show different paper etc.) and use those materials to cover the jars. Before you conduct the experiment, you will predict which jars will have the highest albedo (reflection, and which will have the lowest albedo. How would you be able to measure this? (*By placing a thermometer in the jar filled with water you can measure the increase in temperature caused by absorption of sunlight*)
- You will record the temperatures in each jar at set increments of time and record this information in the table on your worksheets.
- Hand out worksheets and have students conduct the experiment in small groups or as a class activity.

**Materials:**

- Lamp or sunlight
- Thermometers
- A variety of paper or material (black, white, aluminum foil etc.)
- Mason jars or tin cans

**4. Wrap Up and Discussion (10 min.)**

- How did the colour of the material covering the jar (or the thermometer) affect the temperature? (*The darker the material the warmer the temperature*)
- Why was the temperature warmer for some objects than for others? (*The dark materials absorb the heat and the lighter materials reflect the heat*)
- How can the melting of sea ice affect global temperatures? (*Sea ice and snow help to keep the earth's polar regions cool and help to control the earth's overall climate. Ice and snow have bright surfaces, and these bright surfaces can reflect approximately 80 percent of the sunlight back into space. Reflected sunlight means that less of the sun's heat is absorbed. As the snow and ice melt they reveal a darker surface. This dark surface no longer reflects sunlight, but now absorbs approximately 90 percent of the sun's rays. This creates a positive feedback loop, where if there is less sea ice, then there will be less sunlight being reflected and more sunlight being absorbed by the oceans. Increased absorption of light by the ocean will result in warming of the oceans and increases the overall global temperatures (Kaiser, 2010, NSIDC, 2012).)*)

**Assessment:**

- At the end of the class have each student individually complete the *Activity Self-Evaluation* form (see attached).
- Evaluate the Climate Changing Over Time Worksheet.

**References:**

Kaiser, B. (2010). Polar Science and Global Climate: An International resource for Education and Outreach. International Polar Year. Pearson Custom Publishing Ltd. Essex, UK.

NSIDC (National Snow and Ice Data Center) (2012). University of Colorado, Boulder. <http://nsidc.org/cryosphere/quickfacts/seoice.html> accessed on March 6, 2012.

# Climate Changing Over Time Worksheet

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**Question:** How does the colour of an object affect the amount of heat it can absorb or reflect (albedo)?

**1) Hypothesis** (What do you think will happen?): \_\_\_\_\_

## 2) Method:

- Select at least three different materials and use the materials to cover the jars.
- Fill the jars with water and place the thermometer inside of each jar.
- Set the jars under a lamp, and record your results in the table below at set increments of time.

## 3) Variables:

Independent Variable: \_\_\_\_\_

Dependent Variable: \_\_\_\_\_

Controlled Variables: \_\_\_\_\_

## 4) Results:

| Material Colour | Temperature Recorded |            |            |
|-----------------|----------------------|------------|------------|
|                 | __ minutes           | __ minutes | __ minutes |
|                 |                      |            |            |
|                 |                      |            |            |
|                 |                      |            |            |
|                 |                      |            |            |

5) Which material had the warmest recorded temperatures? Which had the coolest? \_\_\_\_\_

\_\_\_\_\_

6) Why do you think the temperature was higher for some objects than for others? \_\_\_\_\_

\_\_\_\_\_

7) How can the melting of Arctic sea ice affect global temperatures? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_