TOWNGREEN2025
Middle School Climate-Change Curriculum

Lesson 10

Carbon Cycles through Ecosystems

Unit Title: **Carbon Cycles through Ecosystems**	
Theme: **Ecosystems & Cycles**	Grade Level: **7**
# of sessions for the unit: **1**	Session #10: **Weather Interview? Not sure of title**
Date created: **Summer 2017**	Author: **B. Allia, C. McWilliams**

CC Climate Change Curriculum

Unit Description

Focusing on systems and cycles, students use their understanding of climate-change and how carbon and thermal energy interact with Earth's land and atmosphere. Students practice skills such as argumentation and collecting and analyzing data. Students gain experience with the interactions of humans and Earth processes with ecosystem dynamics, and with developing solutions to complex climate-change issues. The lessons generally follow this order:

- Introduce unit and culminating event: climate-change's effect upon fauna
- analyze global temperature and carbon dioxide trends
- understand personal climate-change experiences, such as weather, matter and energy uses
- collect wetland and upland forest soil carbon-stores
- sample atmospheric carbon-store
- analyze land and atmospheric carbon-stores
- understand the carbon cycle, pre-human and human era
- describe personal experiences with solid forms of carbon changing into atmospheric carbon
- develop and present solutions to save a fauna from climate-change issues

Standard(s)

Based upon the 2016 MA Science & Technology/Engineering Curriculum Framework

MA LS2 Ecosystems: Interactions, Energy, and Dynamics

MA 7.MS-LS2-3 Develop a model to demonstrate how matter and energy are transferred among living and nonliving parts of an ecosystem and that both matter and energy are conserved through these processes

Unit Goals

1. Create an action plan to decrease carbon in the atmosphere, increase carbon stored by the land, and preserve natural carbon-stores in the ground
2. Build background knowledge of how carbon cycles within a local ecosystem
3. Understand relevant climate-change issues in order to make informed decisions
4. Identify authentic scientific processes, such as sampling, gathering, and analyzing land and atmospheric carbon-content data, in order to validate evidence regarding climate-change

Unit Objectives

Students will be able to

understand that:

1. Carbon cycles through the atmosphere and land
2. Human activities increases atmospheric carbon by burning fossil fuel
3. Atmospheric carbon is a "greenhouse gas"
4. Greenhouse gases increase global temperatures
5. Wetlands and uplands store different amounts of carbon above and below ground

and to:

1. Sample, collect, and analyze primary-source data
2. Collect and analyze secondary data as a means to validate causes of climate-change

Lesson Objectives

1. Students make personal connection how their activities can atmospheric carbon
2. Students collect subjective data about the climate/weather in the past and compare this to current data.

Note any potential barriers to the lesson — consider variability

Student challenges

- having someone old enough to interview
- anxiety about preparing and presenting this project
- Vocabulary, reading, written expression

Teacher challenges

- doing the evidence and reasoning with information just being presented (no time to prep for it). May need to take some notes.

Evaluation/Assessment

(directly linked to the goals, i.e., Formative/Ongoing Assessment or Summative/End of Lesson Assessment)

Assessment

1. Identify evidence of what the weather/climate was like as reported by the interviewee and determine reasoning for the answers provided
2. Complete a compare and contrast graphic organizer to summarize subjective data from the past to current data

Vocabulary

- subjective
- interview
- weather
- climate
- atmospheric carbon

NOTE: Consider the UDL Guidelines in selecting methods and materials to ensure that you provide options for engagement, representation, and action and expression.

Methods

(e.g., Anticipatory Set, Introduce and Model New Knowledge, Provide Guided Practice, Provide Independent Practice)

Timing Suggestions

1. This should be assigned at the end of a class period, taking 5-10 minutes to explain the assignment and what is expected
2. When completed, allow a class period to have students read the answers to the interview questions and then pull out evidence from the responses.
3. This interview assignment has worked best over a holiday weekend or school vacation, when students are more likely to see grandparents(or other older relatives or friends) or have plenty of time to contact them for the interview.

Weather Interview Lesson

1. Introduction
   - A. Inform students they will probably remember the weather/climate they are experiencing for the rest of their lives.
     - Ask them if they think the weather/climate was exactly the same when their parents were kids, or even when their grandparents were kids.
     - Tell students about this assignment to conduct an interview outside of school with someone at least 60 years old. This can be a grandparent or friend or neighbor. Interviews can be conducted in person, over the phone or through an email.
     - Answers are expected to be more than yes or no and detailed answers are necessary for complete understanding.
     - Students should write out the answers with as much detail as they can and are instructed to ask follow up questions if they did not get good detail.
   - B. Handout the assignment sheet, included below with the Weather interview questions (below in materials)
     - This set of questions was designed for the New England coastal area, so if necessary, modify questions so it is more appropriate to your area.
     - Often times, the person being interviewed grew up in a very different area. This is OK and can be used as a discussion point of how the weather/climate is different or similar in different areas.
     - Suggestion: Before you assign this, check to see if there are any staff at the school who are old enough to be interviewed. If they are willing to be interviewed, quietly inform students who claim they have no one to interview to seek out that person or persons. If there are more than a few students saying this, maybe arrange a group interview.
   - C. On the day the assignment is due, have students read the answers to their interviews.
     - There are usually some very interesting stories told.
     - When students are finished reporting, start a list of evidence from what students said that shows how the climate/weather was different and/or the same in the 'old' days compared to current times.
     - Draw out reasoning where possible (i.e., if a river/lake/harbor was frozen then, why did it freeze for as long as it did, or if intervieweesbarely used their air conditioning then, why was that). Compare it to recent years.
     - If answers vary, ask students why they think that is.
     - Explain that subjective evidence is based on the person's remembrance from a long time ago.
     - Compare this to how scientists currently collect this data.

Homework options

1. Actively Learn *www.activelylearn.com*

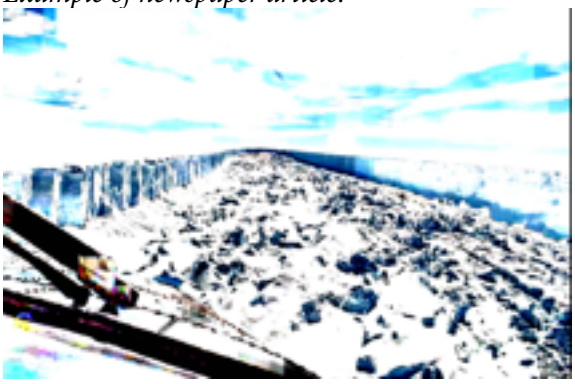
How important was the Pleistocene ice age to human evolution?

How important was the Pleistocene ice age to human evolution?

- Selection options: Short Term Climate-change, Climate-change in Earth History, Impact of Continued Global Warming, Weather versus Climate
- reading comprehension website
- State aligned with guiding questions

2. Peer Reading Response Activity (scroll down to see entire graphic organizer) using Boston Globe July 13, 2017 Iceberg article (teachers may switch article to their own climate-change reading)
   - See Text Passage Peer/Response graphic organizer screen-shot copy inserted below
   - See Boston Globe article inserted below the graphic organizer
   - 1st student completes top 4 boxes while reading article
   - 2nd student completes bottom 4 boxes while re-reading article

Example of newspaper article:



A view of the Larsen C ice shelf from February [illegible] A crack more than 120 miles long had developed over several years.

Colossal iceberg adrift in Antarctica

Ice shelf broke off along crack 120 miles long

By Jugal K. Patel and Justin Gillis
NEW YORK TIMES

A chunk of floating ice that weighs more than a trillion metric tons broke away from the Antarctic Peninsula, producing one of the largest icebergs ever recorded and providing a glimpse of how the Antarctic ice sheet might ultimately start to fall apart.

A crack more than 120 miles long had developed over several years in a floating ice shelf called Larsen C, and scientists who have been monitoring it confirmed Wednesday that the huge iceberg had finally broken free.

There is no scientific consensus over whether global warming is to blame. But the landscape of the Antarctic Peninsula has been fundamentally changed, according to Project Midas, a research team from Swansea University and Aberystwyth University in Britain that had been monitoring the rift since 2014.

"The remaining shelf will be at its smallest ever known size," said Adrian Luckman, a lead researcher for Project Midas. "This is a big change. Maps will need to be redrawn."

Larsen C, like two smaller ice shelves that collapsed before it, was holding back relatively little land ice, and it is not expected to contribute much to the rise of the sea. But in other parts of Antarctica, similar shelves are holding back enormous amounts of ice, and scientists fear that their future collapse could dump enough ice into the ocean to raise the sea level by many feet. How fast this could happen is unclear.

In the late 20th century, the Antarctic Peninsula, which juts out from the main body of Antarctica and points toward South America, was one of the fastest-warming places in the world. That warming had slowed or perhaps reversed slightly in the 21st century, but scientists believe the ice is still catching up to the higher temperatures.

Some climate scientists believe the warming in the region was at least in part a consequence of human-caused climate change, while others have disputed that, seeing a large role for natural variability — and noting that icebergs have been breaking away from ice shelves for many millions of years. But the two camps agree that the breakup of ice shelves in the peninsula region may be a preview of what is in store for the main part of Antarctica as the world continues heating up as a result of human activity.

"While it might not be caused by global warming, it's at least a natural laboratory to study how breakups will occur at other ice shelves to improve the theoretical basis for our projections of future sea level rise," said Thomas P. Wagner, who leads NASA's efforts to study the polar regions.

In frigid regions, ice shelves form as the long rivers of ice called glaciers flow from land into the sea. The result is a bit like a dog in a drain pipe, slowing the flow of the glaciers feeding them. When an ice shelf collapses, the glaciers behind it can accelerate, as if the drain pipe had suddenly cleared.

> 'If the ice shelf breaks apart . . . the glaciers will feel less resistance to flow, effectively removing a cork in front of them.'
> ERIC RIGNOT
> Climate scientist

At the remaining part of Larsen C, the edge is now much closer to a line that scientists call the compressive arch, which is critical for structural support. If the front retreats past that line, the northernmost part of the shelf could collapse within months.

"At that point in time, the glaciers will react," said Eric Rignot, a climate scientist at the University of California, Irvine, who has done extensive research on polar ice. "If the ice shelf breaks apart, it will remove a buttressing force on the glaciers that flow into it. The glaciers will feel less resistance to flow, effectively removing a cork in front of them."

The Antarctic Peninsula may be a canary in a coal mine.

The collapse of the peninsula's ice shelves can be interpreted as fulfilling a prophecy made in 1979 by a renowned geologist named John H. Mercer of Ohio State University. In a classic paper, Mercer warned that the western part of Antarctica was so vulnerable to human-induced climate warming as to pose a "threat of disaster" from rising seas.

He said that humanity would know the calamity had begun when ice shelves started breaking up along the peninsula.

The Larsen A ice shelf broke up over several years starting in 1995; the Larsen B underwent a dramatic collapse in 2002; and now, scientists fear, the calving of the giant iceberg could be the first stage in the breakup of Larsen C.

"As climate warming progresses farther south," Rignot said, "it will affect larger and larger ice shelves, holding back bigger and bigger glaciers, so that their collapse will contribute more to sea-level rise."

Text Passage Peer/Response

Reader – please complete this top chart

Carbon Cycles through Ecosystems

Name: Block: Date:

Facts	**Feelings**
List 3 interesting facts 1. 2. 3.	How did you feel as you read this? What made you feel this way? 1. 2. 3.
Questions	**How this applies to your life?**
List 3 questions you have about the reading 1. 2. 3.	List 3 connections that you thought about 1. 2. 3.

Responder – please complete this top chart

Name: Block: Date:

Confirm the Reader's 3 Facts	**How were your feelings different or the same?**
Underline the text in the reading 1. Page:_____ Paragraph:_____ 2. Page:_____ Paragraph:_____ 3. Page:_____ Paragraph:_____	How did you feel as you read this? What made you feel this way? 1. Different or same because… 2.Different or same because… 3.Different or same because…
Answer the Reader's 3 questions	**React to how it applies to their life**
Using the text book, your science white binder or another reliable source, answer questions 1. 2. 3.	Have you had similar experiences? Did the reader's response surprise you – why? 1. 2. 3.

Materials

Weather Interview

Interview the oldest person that you can and ask the following questions (they should be at least 60 years old). Please write the person's name, age, and where they grew up. Please write full sentence answers.

1. Describe what the January/February weather was like when you were a kid.
2. Were the ocean, harbors, lakes or rivers frozen at all when you were a kid? Describe what they looked like.
3. What else do you remember about the winter weather from when you were a kid?
4. Do you like the winter weather better now or when you were a kid? Why?
5. Think about the summer time when you were a kid. How hot did it get then? Did you have an air conditioner at your house? If yes, did you use it a lot, a little or barely at all?
6. Do you like the summer weather better now or when you were a kid? Why?
7. Compared to when you were a kid, have you seen a big change in the weather over the past 10 years or so? Describe it.