

LP 1

Introduction to Climate Change

# of Days	1		
Prior Knowledge	Students will likely know about different weather phenomena, but may confuse weather and climate.	California English-Language Arts Content Standards	Reading 2.3, 2.4, 2.5, 2.8 (Article Analysis) Writing 2.3.c (Concept Map) Listening & Speaking 1.2 (Article Analysis)
Lesson Objective	Students will be able to identify the relevance of studying climate change and differentiate between elements of weather and climate.	Language Goals/Demands	Students will be able use different terms to relate components of the climate system and weather to each other. Demands: Definitions - Students must be able to recognize keywords that identify definitions; Concept Map - Students must know the difference between and be able to use nouns and verbs.
Lesson Assessment	Quiz 1: Questions in quiz on LP1 & LP2	Changes for Next Time	
California State Science Standard	Earth Science 6.a and 6.b		
Materials Needed	Student handouts, powerpoint slides, computer, projector, internet connection	What Worked Well	
Time	Learning Task or Activity	Method & Notes	
Day 1			
17 min	<p>Lesson Hook</p> <ul style="list-style-type: none"> - Tell students that they are about to start a three week unit on climate change. - Climate change is a big issue in the news, but why is it such a big deal? - You will read a one-page article from Reuters about the impact of climate change on students their age. (The article is about sea level rise in a foreign country.) - Students will read in small groups and then discuss the article using the provided questions. - Make sure you have students think about whether this will impact them or not. - At the end of the activity, have students report to the entire class their headline for the sea level rise issue in the Bay Area 	<p>GROUP WORK</p> <p>See 1.1.1 for Article</p> <p>See Slide 1.1.2 for Article Vocabulary</p> <p>See 1.1.3 for Discussion Questions</p>	

8 min	<p>Sea Level Impact in the Bay Area</p> <ul style="list-style-type: none"> - Here is a map of the sea level rise that could take place here in the Bay Area. (Show Google Map Image of Sea Level Rise) - Show students the current sea level and then have them make predictions about how much rise it will take to flood certain areas close to their school 	<p>WEB DEMO</p> <p>Google Maps Sea Level Rise http://flood.firetree.net/?ll=43.3251,-101.6015&z=13&m=7 (Find the North America Map and Zoom in on your coastal area. Start with 0 meters sea level rise so that students have a baseline and then increase in increments of your choice).</p>
10 min	<p>Defining Weather and the Climate System</p> <ul style="list-style-type: none"> - Tell students that over the next three weeks you will learn more about how climate is changing and the impacts of this change. - But first, we have to make sure we understand exactly what weather and climate are - Go through Slides 	<p>LECTURE WITH SLIDES</p> <p>See Slides 1.1.4</p> <p>You may find it helpful to post 1.1.5 - "Keywords to identify definitions" for the remainder of the unit</p>
5 min	<p>Weather/Climate Confusion</p> <ul style="list-style-type: none"> - Have students watch the Stephen Colbert Video that addresses the common misconception of climate and weather. - While watching the video, have students think about the proper use of weather, climate, and climate systems 	<p>WATCH VIDEO</p> <p>http://www.huffingtonpost.com/2010/02/11/colbert-rips-fox-news-for_n_458075.html</p>
5 min	<p>Video Discussion</p> <ul style="list-style-type: none"> - Discuss the ways in which people use the terms weather and climate and climate system improperly - Discuss the main evidence for support of climate change despite the heavy snowfall. 	<p>DISCUSSION</p>
5 min	<p>Concept Map Introduction</p> <ul style="list-style-type: none"> - Handout Concept Map Instructions - Explain that students will be making a concept map throughout the unit. - Make sure students write in pencil - Finish by explaining students' homework for the night 	<p>LECTURE</p> <p>See 1.1.6 Concept Map Instructions (Student Handout)</p>
HW	<p>Homework: Start your concept map with the following terms: Climate System and Weather. Also, add two or three factors to your map that you think will affect the climate system.</p>	

1.0: Lesson Plan 1 – Introduction to Climate Change

Teacher Guides

- 1.1.1 – Student Hook Article
- 1.1.2 – Article Vocabulary Slide
- 1.1.3 – Small Group Discussion Questions
- 1.1.4 – Weather and Climate System Slides
- 1.1.5 – Keywords to identify definitions
- 1.1.6 – Concept Map Instructions

Videos and Websites

Google Map Sea Level Rise

<http://flood.firetree.net/?ll=43.3251,-101.6015&z=13&m=7>

Stephen Colbert Video

http://www.huffingtonpost.com/2010/02/11/colbert-rips-fox-news-for_n_458075.html

1.1.1 – Unit Introductory Activity



Scientists Say Millions Could Flee Rising Seas

November 10, 2006

By Daniel Wallis, Reuters

NAIROBI – Nations must make plans to help tens of millions of “sea level refugees” if climate change continues to ravage the world’s oceans, German researchers said on Thursday.

Waters are rising and warming, increasing the destructive power of storms, they said, and seas are becoming more acidic, threatening to throw entire food chains into chaos.

“In the long run, sea level rises are going to be the most severe impact of global warming on human society,” said Professor Stefan Rahmstorf, presenting a report by German scientists at a major United Nations climate change meeting.

Warming could melt ice sheets and raise water levels and the report said nations should already be considering making a “managed retreat” from the most endangered areas, including low-lying island states, parts of Bangladesh or even the U.S. state of Florida.

A report by international scientists who advise the U.N. has predicted a sea level rise of up to 88 cm between 1990 and 2100.

The situation was worsened, the German team said on Thursday, by increasing frequency of extreme storms whipped up by warming sea surface temperatures – meaning many would flee coastal areas hit by hurricanes.

Many of the world’s biggest cities, from Tokyo to Buenos Aires, are by the coast. Some rich nations might be able to build higher dikes, such as in the Netherlands, but poor nations were destined to be swamped.

The low-lying Pacific island nation of Tuvalu has already agreed to a deal for New Zealand to take about half its 10,000 people to work in agriculture if it becomes swamped by rising sea levels.

Hurricane Energy

Rahmstorf said their data did not conclusively prove warmer seas created more storms, but that there was a clear link between rising temperatures and hurricanes’ power.



Villager in Bajo village. Bajos live almost exclusively on marine resources at a very low subsistence level. Photo courtesy of WWF-Canon/Jikkie Jonkman

“Since 1980 we’ve seen a strong rise up to unprecedented levels of hurricane energy now in the Atlantic,” he said.

Some 189 nations are meeting in Kenya to explore options for a global deal to combat climate change, with most focusing on cutting the amount of carbon dioxide pumped into the air by industry and modern lifestyles.

The report’s authors, the German Advisory Council on Global Change, said about a third of that carbon dioxide (CO₂) was being absorbed by the world’s oceans, making them more acidic.

If not checked, it said, that would have profound effects on marine organisms – hindering everything from tiny shrimps to lobsters from forming their calcite shells – with disastrous results for ocean food chains, and on human communities depending on sea life to survive.

Coral reefs that attract fish and protect coasts from storms and erosion are also threatened by acidity, and CO₂ emissions meant they could all be dead by 2065, Rahmstorf said.

“Acidity is causing a major threat to coral reefs, on top of the bleaching effect that comes with warming,” he said.

Reefs get bleached when warm water forces out tiny algae living in them, giving reefs nutrients and their vivid colours. Without algae, corals whiten and eventually die.

1.1.1 – Unit Introductory Activity

Teachers Guide to the Introductory Activity

- It is important to introduce students to this article as a specific text type. Talk to them about the difference between a news article and their textbook.
 - Point out the byline that says, 'NAIROBI'. Ask students if they can think what the significance of NAIROBI is. They might think about this as they read the article.
 - Point out that each paragraph in the article is only one sentence long. Why might the article be organized in this way?
- After students have read the article, you might have them think about the different nations that were mentioned and the significance of mentioning so many different places. It might be helpful to show them these different places on the map.
- It might be helpful to have a meterstick handy so that students can see how high 88 cm is.
- Other important discussion questions appear on the small group discussion handout 1.1.2.

Article Vocabulary

- Refugees – A person who flees their home for safety reasons.
- Dikes – An embankment to prevent floods.
- Conclusively – No doubt
- Unprecedented – Never before seen or done.
- Calcite Shells – A type of shell made of calcium carbonate, the mineral found in limestone.

Article Vocabulary

- Acidic – Having lots of hydrogen ions. Heavily acidic solutions can often be harmful to organisms.
- Ravage – To destroy
- Impact – To have a strong effect on
- Low-lying – Places that are lower in elevation than nearby places.

Article Vocabulary

- Link – To connect things together
- Marine – Related to the sea or oceans
- Organism – A living thing
- Bleach – To remove the color from

1.1.3 Small Group Discussion Questions

Directions: As a group, discuss the following questions:

1. What are the specific causes of sea level rise mentioned in this article?
2. How are people around the world affected differently by the consequences of sea level rise?
3. Other than sea level rise, what are some other impacts of climate change mentioned in the article?
4. How could sea level rise affect our lives here in the Bay Area?

Final Task: As a group, decide on a headline for an article on how sea level rise could affect our lives here in the Bay Area. (Make sure that someone in the group writes this down!)

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Climate System and Weather

We often hear the words climate and weather, but we often fail to realize the relationship between weather and the climate system. In order to understand the climate system, it is important to understand what a 'system' is.

It might be helpful to use an illustration. Think about a bicycle. If you took the bike apart and had each of the pieces laying in your driveway, the bicycle would not be very useful. However, when the pieces are assembled, even though no new pieces are added, the bicycle allows you to travel great distances in a short amount of time. You can think of the bicycle as a system. It has many parts that work together to produce something new – in this case a mode of transportation.

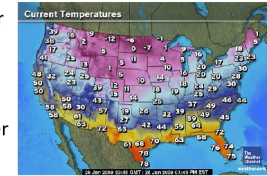
Climate systems are similar. The climate system is made up of many different factors including the Earth's water, clouds, atmosphere, and temperature that work together to produce weather.

Weather

Weather refers to:

The state of the atmosphere in a particular place and time.

Weather occurs over short time periods. The weather predictions usually cover days or weeks.



Types of Weather

- What terms do you associate with weather?



Ask students to think of things that they associate with weather. Perhaps it is helpful to make a list on the board.

What Causes Weather?

- Weather is an expression of the climate system.
- The climate system is the interaction of the atmosphere, biosphere, and other parts of the Earth that determine weather at a time or place



The Atmosphere



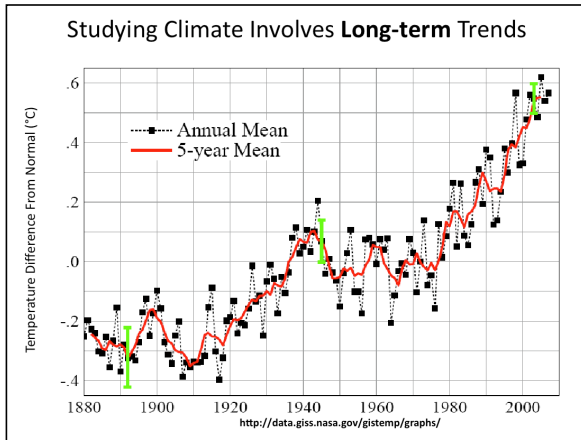
The Biosphere



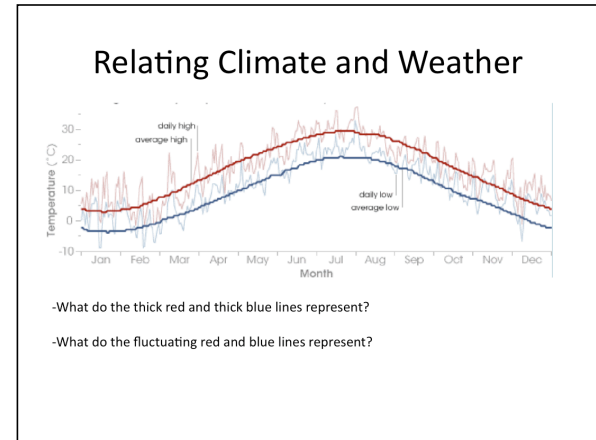
The Oceans

A system is the interaction of different parts that produce something new.

Teacher's Note: This is probably a new way for students to think about weather or climate. It might be good to have students rephrase in their own language what they think it means for the weather to be an expression of the climate system.



Looking at weather change involves only days, weeks, or months. Studying climate change requires studying long-term trends, often times 30, 50, or 100 years. (Students don't need to understand this graph, but they should just recognize the time frame that shows the climate. This graph will come up again in LP 4)



Here is a graph that relates the climate and weather.

Have students work in pairs to look at the graph to understand that weather is an expression of the climate system. It might be helpful to scaffold it in the following way:

1. Define the x and y-axis. What do they represent?
2. What does an individual point on this graph represent?
3. What do the two different colors represent?
4. What is the trend in the thick lines?
5. What is the trend in the wavy lines?
6. Which lines do you think represent weather and which represent climate?

At this point it is important to tell students that climate is usually measured in 30 year periods. This is not an exact number, but is rather a convention used by scientist.

Notice that long-term averages, here the climate, is represented by the thick red (highs) and blue (lows) lines.

Each day's or months weather may not be exactly like the long-term climate, but it fluctuates with the trend shown by the climate line.

Why is the Climate System Important?

- The climate system determines the weather. The weather affects many of our daily decisions.
- Climate affects long-term decisions by humans.
- Climate affects long-term trends in plants and animals.

Ask students why understanding the climate system might be important.

Once you connect the weather system to climate. Ask how the weather affects decisions that students make.

What do you think?

- The following video talks about weather, climate, and climate change.
- While watching the video, think about whether the terms weather and climate are used appropriately given the definitions.

[Click Here for Video Link](#)

This slide leads into the Stephen Colbert Video that discusses the anomalous snow fall that occurred in Washington DC (2010) prompting many people to comment that this must mean there is no evidence of climate change.

Have students watch the video and think about the definitions of weather and climate. After the video have students discuss the different arguments that are presented and how they fail to properly use the terms weather and climate/climate system.

An interesting question for students might be to look up the weather in the winter 2010 in Fairbanks Alaska (it was unusually warm) to show that you can't take one data point and make generalizations about the climate.

Video Link: http://www.huffingtonpost.com/2010/02/11/colbert-rips-fox-news-for_n_458075.html

Keywords used in definitions

- Weather refers to
- Weather is.....
- Climate Models are.....
- Efficiency means that.....

1.1.6 Concept Map Directions

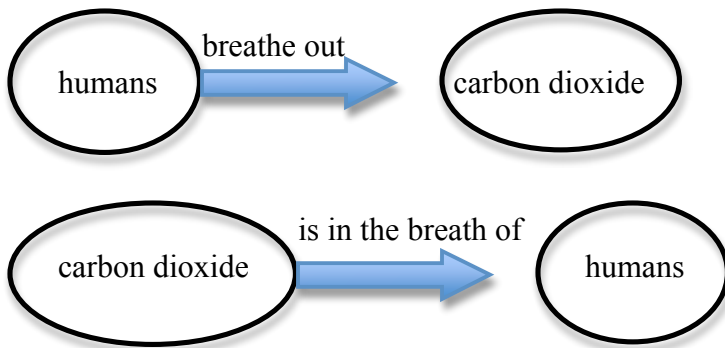
You are going to create a concept map over the next 3 weeks. A concept is a general idea or notion formed about a particular thing. A concept map is a visual representation of your understanding of the different parts that make up a concept. This concept map will focus on climate change. Every few days you will get a few new concepts to add to your map.

Key parts to a concept map:

- concepts
- linking lines with arrows
- linking phrases

The concepts are words that represent a thing or idea. You will be linking concepts with a line which has an arrow. On top of the line you will write a linking phrase that completes a sentence. For example, if you were given the words ‘trees’ and ‘birds’, you might write a linking statement ‘Birds build nests in trees’ with the arrow pointing to trees or a statement “trees are homes to birds” with the arrow pointing towards birds.

Example:



Start your concept map in the center of your paper and make the font small, but legible. You will be adding about 25 more concepts over the course of the unit. **Please use pencil.**

If you can't make a complete phrase on the arrow, feel free to put it a complete sentence using both concepts at the bottom of the page.

First Words for your Concept Map:

Climate System

Weather

Atmosphere

Also add to your concept map:

Two factors that you think affect the climate

Complete Concept Map Word List:

LP 1

Climate System

Weather

Atmosphere

2 other words (temperature, variation)

LP 2

Sun

Earth

Energy Budget

Albedo

Long wave radiation

Short wave radiation

LP 3

Greenhouse gases

Carbon Dioxide

Water Vapor

Methane

Nitrous Oxide

Atmosphere

Temperature

Mitigation

Power Plant

Nuclear Power

Wind

Fossil Fuel

Sinks

Forests

Oceans

Renewable Energy

LP4

Sea Level Rise

Glacial Cover

Ice Cores

LP5

No concept mapping as of now
(adaptation, mitigation, land ice)

LP 6

No concept mapping as of now
(consensus, evidence)

LP 7

No concept mapping as of now
(strategy, carbon emissions, transportation,
electricity, biofuel)