# Cloudy with a Chance of Science! Week 3: Grades 6-8

| Day | Topics | Related Standards |
|---|---|---|
| 1 | Climate vs. Weather | Analyze and interpret data to construct an explanation for how advances in technology has improved weather prediction. |
| 2 | Building a House Right for the Climate | |
| 3 | Building a House Right for the Climate | |
| 4 | Dinosaur Breath | Construct and support an argument about how human consumption of limited resources impacts the biosphere. |
| 5 | Global Temperature Trends | |

# Cloudy with a Chance of Science! Week 3

## Day 1: Climate Vs. Weather

### Teacher/Parent Background:

Understanding short term weather conditions compared to atmospheric conditions averaged over a longer period of time helps students interpret cycles, patterns, and natural events on Earth. Students have had prior experience with the weather vs. climate component of this concept in fourth grade where students collected, analyzed, and interpreted data to explain weather and climate patterns.

We are going to go beyond interpreting simple weather maps, so that students must differentiate between weather and climate by compiling and making generalizations about weather data and trends (repeated patterns) for a longer

period of time to infer climate conditions for specific regions. In the next 2 day's activities we will focus on 3 main concepts:

- Weather refers to the daily environmental conditions we experience around us.
- Climate refers to the average conditions in a place over a longer period of time.
- Weather can be observed each day, whereas climate must be observed over time.

**Overview:** In this activity, students will collect weather data, predict weather conditions, and compare and contrast current weather data with climate in order to build a house right for the climate.

## Related Standards:

- Analyze and interpret data to construct an explanation for how advances in technology has improved weather prediction.

## Key Terms:

Weather- Describes the condition of the air outdoors, such as temperature, cloud cover, wind speed and rainfall.

Climate- The set of weather conditions that prevail in a region year after year.

Precipitation- Rain, snow, sleet or hail that falls from the clouds in the sky.

Temperature- How hot or cold something is.

Data- Pieces of information.

Humidity- The amount of water vapor in the air.

Typical- Common

## Materials List:

Pen/Pencil

## Activity Description:

Students will read the short summary about weather and climate, look through these slides made available by Stanford University and/or watch this video, sort various situations as either descriptive of weather or climate and then analyze 2 graphs to determine if they are showing climate or weather data.

Answers:

| Weather | Climate |
|---|---|
| B, G, J, K, L, M, N, O | A, C, D, E, F, H, I, P |

Top graph is climate and the bottom graph is weather.

## Closure:

Discuss the following with students:

How are weather and climate different? Weather is the day to day changes in the condition of the atmosphere, but climate is the average over a long period of time.

Compare the weather of two of the environments. Answers will vary. Possible answers: the desert environment receives little rainfall and has hot temperatures, whereas the beach environment receives a high amount of rainfall and the temperatures may vary from hot to cool or cold.

Why do you think a climatologist studies climate? Answers will vary. Possible answer: to be able to predict dramatic changes in the climate for an area or to be able to show how humans are affecting the climate.

## Extension:

-Arrange a video conference with someone living in a different climate who would be interested in talking to the class on zoom. Share the differences and similarities in temperature and precipitation as well as sports and outdoor activities.

-Climate Travel Brochures: Ask students where they might like to travel once it's safe to. Assign students to a variety of destination climates that they research in order to make a travel brochure for that tourist area that emphasizes the great climate. For example if they have Vail, Colorado they would find out that the town has a mountain climate and is best for skiing and snowboarding. They would need to research which months would be best for traveling to that area. Another example would be the tropics such as a Caribbean island. Students will find out that tropical island climates are great for beach and ocean activities, but will also discover certain months are typically very rainy and should be avoided.

# Student Handouts

Read the Following:

You're going on vacation in a week and you have to start thinking about what clothes you're going to pack for your trip. You've read the weather reports for your vacation spot, but you know that the weather can change from day to day. You decide that the best way to pack is to choose clothes that work best for the climate you're going to. Is that a wise decision? What exactly is the difference between weather and climate?

**What is weather?** When we talk about weather, we mean the daily conditions in the atmosphere of a local area. Many conditions make up the weather. A few are cloud cover, wind, humidity, and temperature, which is how hot or cold the air is. One condition that is important for planning a vacation is rainfall. Rain is a type of precipitation. Precipitation is water that falls to Earth from clouds. There are many forms of precipitation, including rain, sleet, hail, and snow. They are all slightly different based on the temperature of the air as the water falls through it. Rain is liquid water that falls in droplets. Snow and hail, on the other hand, are particles of ice that fall when it is colder outside. Sleet is a mixture of rain and snow. Weather is an important part of daily life. It describes the changing conditions of the environment around us.

All weather is caused by the Sun heating Earth. When the Sun's energy heats the atmosphere unevenly, it causes different air pressures. Pressure is the weight of the air. Cold air weighs more than warm air because it is denser. Low-pressure air and high-pressure air cause different weather conditions. Low-pressure air often brings rain, thunderstorms, and hurricanes. High-pressure air usually means clear skies and sunshine. The uneven heating of the atmosphere is the reason there is different weather in most places on Earth during spring, summer, autumn, and winter.

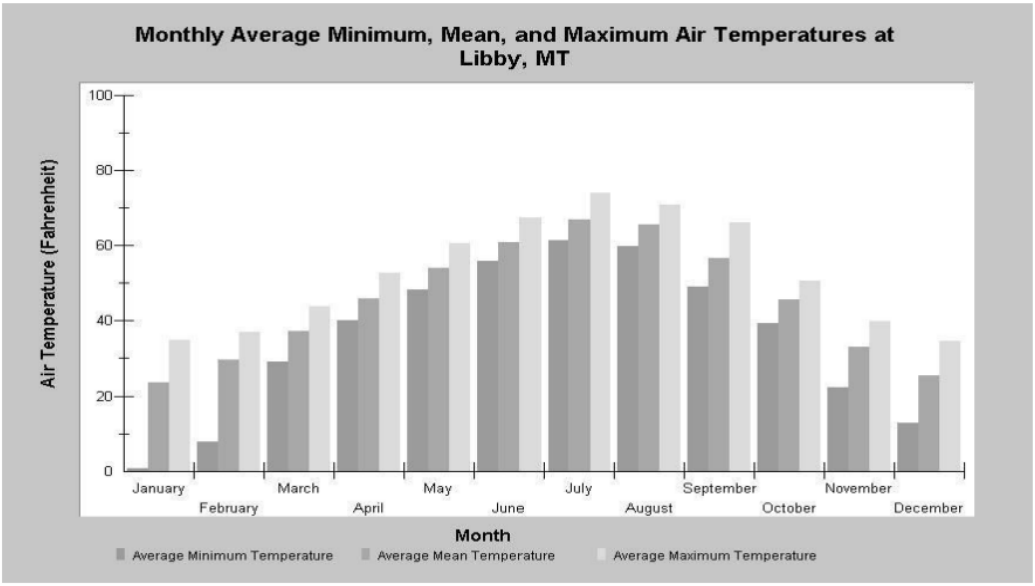
**What is climate?** Weather is constantly changing. Scientists who predict, or forecast, the weather can't usually make forecasts beyond 10 days. Even weather reports cannot guarantee that the forecasts will be accurate. However, climate in a particular area is consistent. Climate is the type of weather in an area averaged over a long period of time, such as 30 years or more. For example, when most people think of Hawaii they picture sunshine, high temperatures, and warm rainfall. Hawaii has a tropical climate. The weather there is usually warm and humid with cool breezes and it has been that way for many years. But, that doesn't mean that Hawaii doesn't have days with cold temperatures and storms. The climate of an area describes its average temperatures, precipitation, humidity, wind, cloud cover, and other weather conditions over long periods of time. An area's climate is affected by its distance from water, its latitude on the globe, and its elevation above sea level.

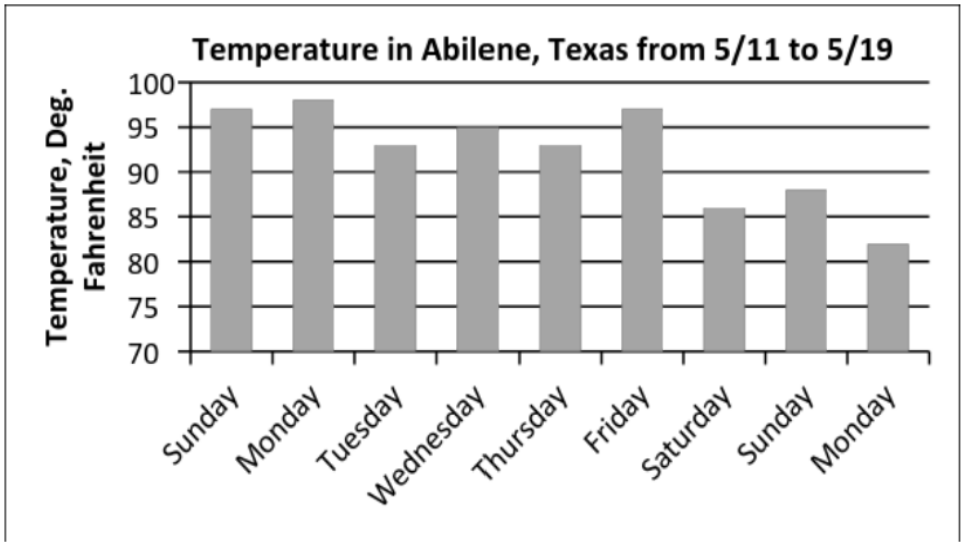
2. Sort the following situations as either an example of weather or climate:

| | | | |
|---|---|---|---|
| **A** The average yearly rainfall in Yuma is 3 inches. | **B** In 2005, Hurricane Katrina hit the Gulf Coast. | **C** When looking at the precipitation in the desert over time, we noticed that the desert is very dry. | **D** It is usually raining in Seattle. |
| **E** In a tropical rain forest it is very humid and rains almost every day | **F** A typical day in Brazil would be humid and hot. | **G** A big blizzard in Connecticut caused power outages across the state | **H** The average high temperature for Phoenix, AZ, is 93° F. |
| **I** Every year when Rashad goes to Colorado for Christmas, there is plenty of snow for skiing. | **J** The highest recorded temperature for Tucson, Arizona, is 117°F | **K** Maria looked out her window and noticed it was a cloudy day. | **L** Yesterday was the hottest day of the year. |
| **M** I had to put on a sweater today because it was cold. | **N** It was cloudy and rainy all weekend. | **O** Jenny's roof sprang a leak last week because of all the rain. | **P** Arizona is dry most of the time |

| Weather | Climate |
|---|---|
| | |

3. Analyze the two graphs below. Write a big "C" over the graph that describes climate and a big "W" over the graph that describes weather.



# Cloudy with a Chance of Science! Week 3: Grades 6-8

## Day 2: Building a House Right for the Climate

### Teacher/Parent Background:

Understanding short term weather conditions compared to atmospheric conditions averaged over a longer period of time helps students interpret cycles, patterns, and natural events on Earth. Students have had prior experience with the weather vs. climate component of this concept in fourth grade where students collected, analyzed, and interpreted data to explain weather and climate patterns.

We are going to go beyond interpreting simple weather maps, so that students must differentiate between weather and climate by compiling and making generalizations about weather data and trends (repeated patterns) for a longer period of time to infer climate conditions for specific regions. In the next 2 day's activities we will focus on 3 main concepts:

- Weather refers to the daily environmental conditions we experience around us.
- Climate refers to the average conditions in a place over a longer period of time.
- Weather can be observed each day, whereas climate must be observed over time.

**Overview:** In this activity, adapted from Teachengineering.com, students will differentiate between weather and climate so that they can research the characteristics of different climate regions and begin designing a home to withstand the elements found in a specific climate region.

### Related Standards:

Analyze and interpret data to construct an explanation for how advances in technology has improved weather prediction.

### Key Terms:

Weather- Describes the condition of the air outdoors, such as temperature, cloud cover, wind speed and rainfall.

Climate- The set of weather conditions that prevail in a region year after year.

Precipitation- Rain, snow, sleet or hail that falls from the clouds in the sky.

Temperature- How hot or cold something is.

Data- Pieces of information.

Humidity- The amount of water vapor in the air.

Typical- Common

## Materials List:

Possible Building Materials May Include:

- Cardboard
- Popsicle Sticks
- Straws
- Fabric Scraps
- Rocks
- Duct tape or Masking tape
- Paper
- Toothpicks
- Foil
- Plastic Wrap

## Activity Description:

1. Make students aware that they will be designing and building a prototype of a house for different climate regions in the continental U.S.
2. Students will review weather vs. climate with the Comparing Weather and Climate table in the Student Handout.

Answers:

| Comparing Weather and Climate | | |
|---|---|---|
| | **Weather** | **Climate** |
| **Definition** | The condition of the atmosphere at a place at any given time | The general weather of an area over a long period of time |
| **Components** | Precipitation, fronts, cloud cover, wind speed, temperature, thunderstorms | Precipitation, temperature, humidity, wind speed, amount of sunshine |

| | | |
|---|---|---|
| **Determined By** | Measuring precipitation, wind speed, etc., on a daily basis | Averaging weather statistics over a period of at least 30 years |
| **Time Frame** | Measured for a short period of time | Measured over a long period of time |

3. Students will observe the map of the climate zones of the continental U.S. and choose to design a house for the humid subtropical, humid continental or midlatitude desert climates.
4. Encourage students to follow the steps of the engineering design process today students will engage in the ask, imagine and plan phases of the engineering design process.
    a. Ask: Students should research things such as how hot does it get in their climate region? Is flooding common? Is there a lot of snowfall? Etc.
    b. Imagine: Students should sketch two possible solutions.
    c. Plan: Students will choose their best solution and make sure they label their plans with the materials they plan on using.

## Closure:

Discuss the following with students:

-What aspects of climate (average temperatures, average rainfalls or snowfalls, etc.) and weather (tornadoes, hurricanes, etc.) the engineers should consider when designing and constructing buildings and homes. *Climate: Average temperature, average rainfall or snowfall. Weather: Tornadoes, hurricanes, etc.*

-What are some examples of how people in different cultures and locations create(d) homes with different design, construction and materials? What materials do/did they use? How do/did climate considerations shape the house designs? (Listen to student answers; correct and amend as necessary.)

## Extension:

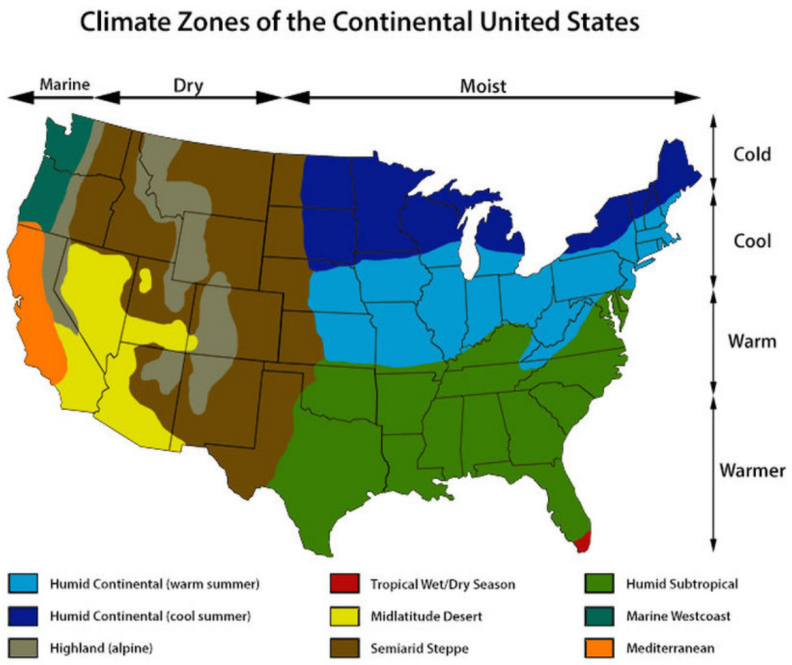
-Read & Learn: Eye of the Storms

-Have students show photographs or pictures of houses from magazines and talk about why they think each home was designed in its particular way. Can we figure out what climate they were designed for just by looking at the pictures?

# Student Handouts

Fill in the table based on your knowledge of weather vs. climate.

| Comparing Weather and Climate | | |
|---|---|---|
| | **Weather** | **Climate** |
| **Definition** | | |
| **Components** | Precipitation, fronts, cloud cover, wind speed, temperature, thunderstorms | Precipitation, temperature, humidity, wind speed, amount of sunshine |
| **Determined By** | | |
| **Time Frame** | | |




Choose to build your house in one of the three U.S. climate regions:

Humid Subtropical- Hot and humid summers with mild winters and lots of rainfall.

Humid Continental- Summers are cool and winters are freezing, snowy, and windy.

Midlatitude Desert- Very hot and dry summers with mild winters. Very little rainfall.

Every climate has weather extremes that homes need to be able to handle. Your challenge will be to build a home for the climate of your choice. You can use any materials you have at home. In addition to being aesthetically pleasing your home will also need to be able to to withstand the following challenges depending on the climate region.

Humid Subtropical- Your house must keep a piece of tissue paper dry inside when you pour 1 cup of water (rain) on top of it.

Humid Continental- Your house must be able to keep the roof from caving in when you pour a lot of snow (1 cup of rice) on top of it.

Midlatitude Desert- Your house must be able to keep an ice cube from melting as you heat the house with a hairdryer for 1 minute.

Work through the engineering design process to build your home!

## Imagine

| Possible Solution #1<br>(include a diagram with labels) |
| --- |
| |

| Possible Solution #2<br>(include a diagram with labels) |
| --- |
| |

## Plan

Choose your best plan from above and make any tweaks. Make sure your plan is labeled with the materials you plan on using.

| Chosen Solution |
| --- |
| |

# Cloudy with a Chance of Science! Week 3: Grades 6-8

## Day 3: Building a House Right for the Climate

### Teacher/Parent Background:

Understanding short term weather conditions compared to atmospheric conditions averaged over a longer period of time helps students interpret cycles, patterns, and natural events on Earth. Students have had prior experience with the weather vs. climate component of this concept in fourth grade where students collected, analyzed, and interpreted data to explain weather and climate patterns.

We are going to go beyond interpreting simple weather maps, so that students must differentiate between weather and climate by compiling and making generalizations about weather data and trends (repeated patterns) for a longer period of time to infer climate conditions for specific regions. Today's activities we will focus on 3 main concepts:

- Weather refers to the daily environmental conditions we experience around us.
- Climate refers to the average conditions in a place over a longer period of time.
- Weather can be observed each day, whereas climate must be observed over time.

**Overview:** In this activity, adapted from Teachengineering.com, students will use their knowledge of the components of climate to build a house to withstand the characteristics of a specific climate region.

### Related Standards:

Analyze and interpret data to construct an explanation for how advances in technology has improved weather prediction.

### Key Terms:

Weather- Describes the condition of the air outdoors, such as temperature, cloud cover, wind speed and rainfall.

Climate- The set of weather conditions that prevail in a region year after year.

Precipitation- Rain, snow, sleet or hail that falls from the clouds in the sky.

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Data- Pieces of information.

Humidity- The amount of water vapor in the air.

Typical- Common

## Materials List:

Possible Building Materials May Include:

- Cardboard
- Popsicle Sticks
- Straws
- Fabric Scraps
- Rocks
- Duct tape or Masking tape
- Paper
- Toothpicks
- Foil
- Plastic Wrap

## Activity Description:

Today students will build and test their homes. Students may use the materials listed above or any household items they find. Encourage students to share images of their finished products and videos using flipgrid.com of the houses being tested!

## Closure:

Discuss the following with students:

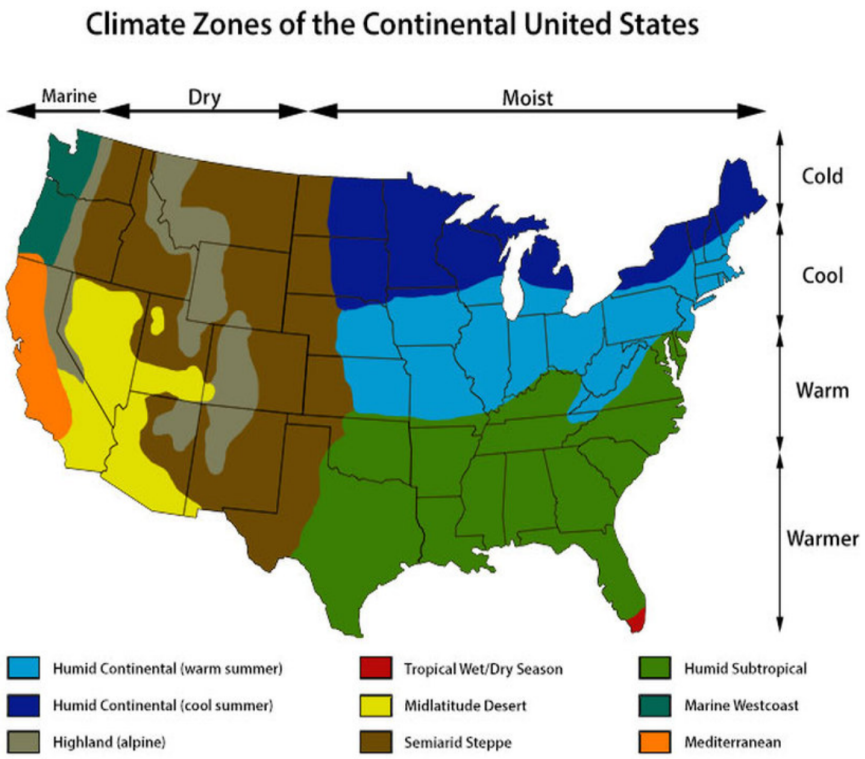
-What was a successful design in each climate region?

-How could you have improved your design?

## Extension:

-Read and Discuss: The Climate is Changing. So must Architecture.

# Student Handouts




Choose to build your house in one of the three U.S. climate regions:

Humid Subtropical- Hot and humid summers with mild winters and lots of rainfall.

Humid Continental- Summers are cool and winters are freezing, snowy, and windy.

Midlatitude Desert- Very hot and dry summers with mild winters. Very little rainfall.

Every climate has weather extremes that homes need to be able to handle. Your challenge will be to build a home for the climate of your choice. You can use any materials you have at home. In addition to being aesthetically pleasing your home will also need to be able to to withstand the following challenges depending on the climate region.

Humid Subtropical- Your house must keep a piece of tissue paper dry inside when you pour 1 cup of water (rain) on top of it.

Humid Continental- Your house must be able to keep the roof from caving in when you put a lot of snow (1 cup of rice/dry beans) on top of it.

Midlatitude Desert- Your house must be able to keep an ice cube from melting as you heat the house with a hairdryer for 1 minute.

Yesterday you imagined your plan. **Today you will build and test your design.**

- Take photos or video while you test your design to share with your teachers!

# Cloudy with a Chance of Science! Week 3: Grades 6-8

## Day 4: Dinosaur Breath

### Teacher/Parent Background:

Of the more than 100 known elements, carbon is one of the most important and widely used in living systems. Individual carbon atoms cycle between the atmosphere and the biosphere through a series of steps. The main form of carbon in the atmosphere is carbon dioxide gas. In living systems, carbon exists mostly as carbohydrates and lipids. The law of conservation of matter states that matter can be neither created nor destroyed, but may only change in form. Therefore, matter and energy will cycle throughout the biosphere from one sphere to another accordingly. Different organisms play different roles in the carbon cycle. If one of the steps in the cycle were to fail, then the flow of molecules would cease, and the entire biosphere would collapse.

Most of the earth's carbon is sequestered in the oceans and the lithosphere. The atmosphere, biosphere, and ocean surface waters cycle carbon much more rapidly than the deep ocean and the lithosphere. There is a balance among the autotrophs, heterotrophs, and abiotic components of the carbon cycle. The excessive use of fossil fuels puts the balance at risk by accelerating the release of sequestered carbon from the lithosphere.Carbon dioxide ($CO_2$) is considered a greenhouse gas because it has the ability to absorb infrared radiation. At pre-industrial levels (around 280 ppm), this compound's ability to hold heat was critical to supporting life on earth, as this effect helped trap the sun's energy in the form of heat. However, at elevated levels (around 400 ppm as of 2012), carbon dioxide's ability to absorb heat contributes to elevated temperatures on earth's surface, which is causing global climate changes. Sources of $CO_2$ emissions may be natural, such as volcanoes, forest fires, the decay of organic matter, or animal respiration. At normal $CO_2$ atmospheric concentrations, the oceans are able to absorb and remove carbon from the atmosphere. Sources that remove carbon are known as carbon sinks. Plants are another carbon sink. Since the industrial revolution, the burning of fossil fuels has added $CO_2$ to the atmosphere at a rate faster than the sinks can keep up with. Deforestation, caused by industry or forest fires, has also removed a large part of the earth's carbon sink system, making the problem of above normal $CO_2$ levels in the atmosphere worse.

**Overview:** In this activity, adapted from Teachengineering.com, students will learn about the geological carbon cycle. They investigate the role of dinosaurs and other ancient biomass in the carbon cycle and the eventual storage of carbon. Students discover how the carbon cycle has been occurring for millions of years and is necessary for life on Earth.

## Related Standards:

Construct and support an argument about how human consumption of limited resources impacts the biosphere.

## Key Terms:

Climate- The set of weather conditions that prevail in a region year after year.

Data- Pieces of information.

Carbon Cycle- The continuous movement of carbon among the abiotic environment and living things.

Fossil Fuels- Fossil fuels such as coal, petroleum products and natural gas are the results of ancient biomass.

## Materials List:

- 3-4 pieces of chalk (NOT dustless chalk)
- 1tsp of baking soda
- rolling pin and hard surface to crush chalk
- 1 small sandwich bag in which to crush chalk
- ¼ cup vinegar (either red or white)
- 2 disposable water bottles
- 1 small balloon

## Activity Description:

1. Ask students to read through the background reading, Life of a Carbon Atom and discuss the investigating questions through google classroom or some other online platform, if possible.
2. Make sure students understand the answer to the final two questions:
    a. . How did the carbon atom become natural chalk? *The carbon atom became natural chalk after it was captured by the tiny marine creature, who used the carbon to build its shell. When the sea creature died, its remnants (including its shell) sank to the*

*bottom of the ocean floor and formed sediments of limestone and chalk. These sediments were raised above sea level by tectonic activity to create large rock formations, like the White Cliffs of Dover, where a lot of natural chalk is mined today.*

b. How can we release the carbon contained in the natural chalk, which could be from the exhaled breath of a dinosaur?*We can release the carbon contained in the natural chalk, which could be from the exhaled breath of a dinosaur, through a simple chemical reaction with vinegar. The carbon atoms combine with oxygen in the atmosphere to form carbon dioxide.*

3. Have students follow the activity instructions on the student handout. You can watch this video to see the setup in order to better help students troubleshoot or if you want to do this as a demo on a zoom call.

## Closure:

Discuss the Following with your students:

What are some carbon-containing objects? Seashells, plants, and coal. Anything that is or was once living and the atmosphere as it contains $CO_2$ and other carbon based gases.

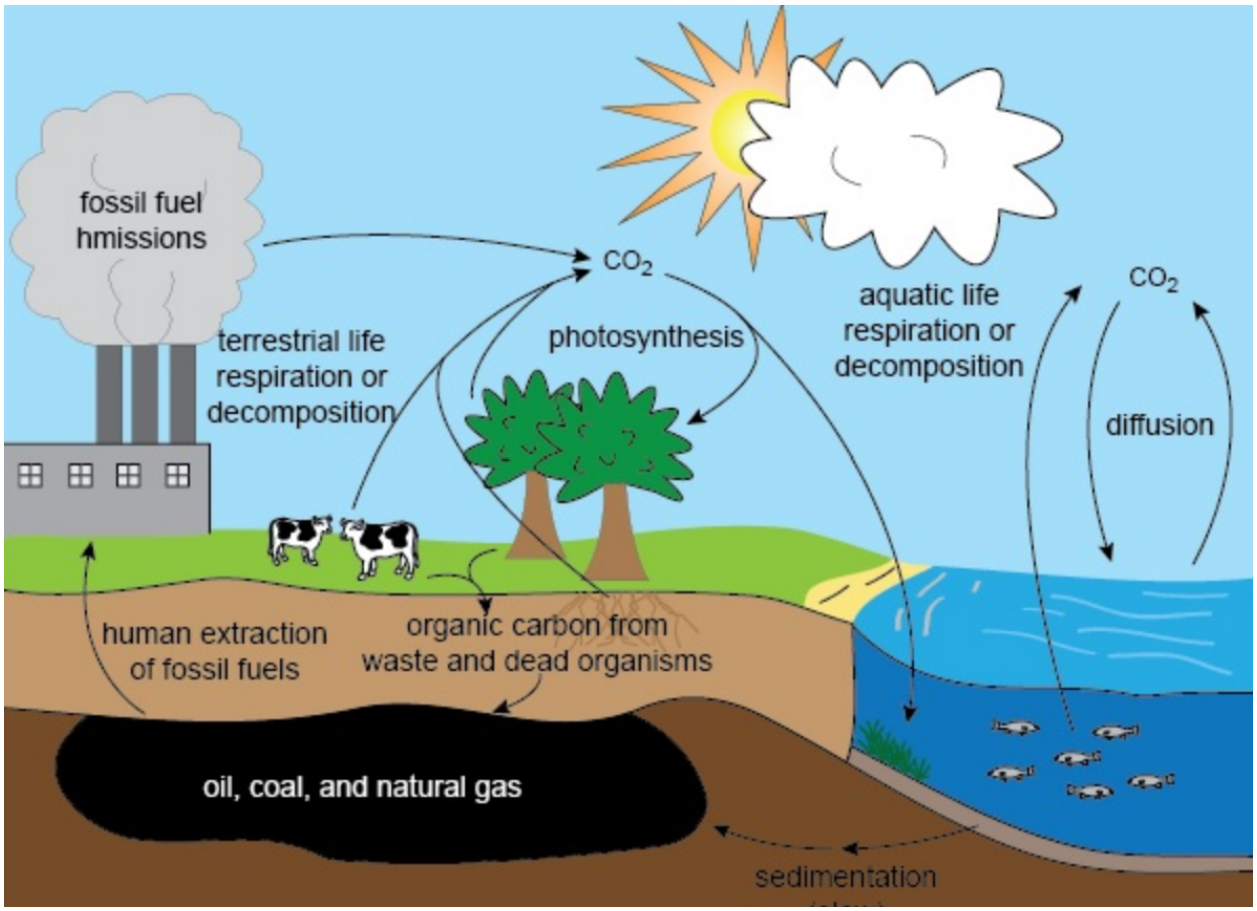
-Carbon is exchanged between the atmosphere, biosphere, hydrosphere and geosphere. What are some ways in which carbon is released into the atmosphere? Respiration, burning of biomass, deforestation and combustion of fossil fuels.

## Extension:

-Explore and Learn:

- A Student's Guide to Global Climate Change
- The Carbon Cycle

# Student Handouts




1. Gather the following materials:
    - 3-4 pieces of chalk (NOT dustless chalk)
    - 1tsp of baking soda
    - rolling pin and hard surface to crush chalk
    - 1 small sandwich bag in which to crush chalk
    - ¼ cup vinegar (either red or white)
    - 2 disposable water bottles
    - 1 small balloon

2. Seal sticks of chalk into plastic bags. Using the rolling pin and a hard surface, crush the chalk into as fine a powder as possible.

3. Fill one water bottle with about four tablespoons of the crushed chalk and the baking soda.

4. Fill the second water bottle with the vinegar.

5. Pour the vinegar into the bottle with the chalk and baking soda and then very quickly place the balloon securely on the mouth of the container containing chalk, baking soda and the vinegar.

6. Explain the reaction resulting from the addition of vinegar to chalk. In other words, what happened when you added the vinegar? What resulted from this reaction? What did you see, hear and smell?

_____

_____

_____

7. Explain the carbon cycle and how it is possible that dinosaur breath was released when vinegar was added to chalk. It might be helpful to refer to the background reading to answer this question.

_____

_____

_____

# Cloudy with a Chance of Science! Week 3: Grades 6-8

## Day 5: Global Temperature Trends

### Teacher/Parent Background:

Photosynthesis, respiration and $CO_2$ absorption/release from the ocean surfaces are all examples of natural fluxes of carbon through the Earth's systems. Human activities, particularly fossil fuel burning and deforestation, disrupt this natural flux by releasing $CO_2$ into the atmosphere. When we mine coal and extract oil from the Earth and then burn these fossil fuels for transportation, heating, cooking, electricity and manufacturing or when we clear-cut forests to support agriculture, we are effectively moving carbon more rapidly into the atmosphere than is being removed from the atmosphere naturally through the sedimentation of carbon. This causes the concentration of $CO_2$ in the atmosphere to increase and the $CO_2$ concentration in the atmosphere is now higher than it has ever been, which is causing global warming.

**Overview:** In this activity, adapted from Jet Propulsion Laboratory Education, students will use global temperature data to create models and compare short-term trends to long-term trends. They will then determine whether global temperature is rising based on the data.

### Related Standards:

Construct and support an argument about how human consumption of limited resources impacts the biosphere.

### Key Terms:

Climate- The set of weather conditions that prevail in a region year after year.

Data- Pieces of information.

Carbon Cycle- The continuous movement of carbon among the abiotic environment and living things.

Fossil Fuels- Fossil fuels such as coal, petroleum products and natural gas are the results of ancient biomass.

Greenhouse Gas- A gas that absorbs and emits radiant and thermal energy. Carbon dioxide is an example of a greenhouse gas.

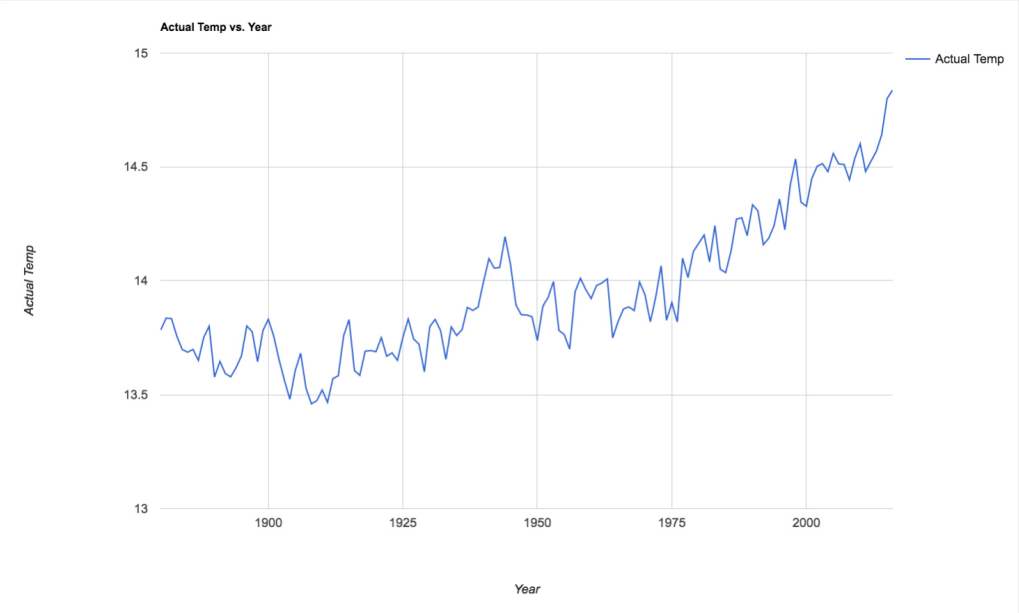
## Materials List:

- Pen/Pencil

## Activity Description:

Scientists have concluded that our climate is changing, that global temperatures are on the rise, and that there are serious consequences to these rising temperatures. But in an age of plentiful yet opposing information, how do students separate fact from fiction? Simple: Examine the source data and do the math. This activity allows students to examine real science data from NOAA and draw their own conclusions about trends in global mean temperature.

1. Have students follow directions on the Student Handout.
2. Completed student graphs should be similar to the image below. Students are graphing only 28 data points as compared to 137 on the graph below.




3. Once students have completed the graph and question on the Student Handout post this video explaining greenhouse gases and this video on our Earth's increasing global temperatures on google classroom.

## Closure:

Discuss the following with students:

-What do you expect the graph to look like in 2020? 2025? *It is expected that the line continues to move with an upward trend.*

-How does the carbon cycle play a role in increasing global temperatures? *Fossil fuels are carbon based and act as a carbon sink. When fossil fuels are extracted from the Earth and burned the carbon that was once part of an ancient living organism is emitted into the atmosphere at $CO_2$. $CO_2$ is called a greenhouse gas because it absorbs heat. With increasing amounts of fossil fuels being burned, increasing amounts of $CO_2$ is being emitted into our atmosphere which is causing increasing global temperatures.*

## Extension:

-Explore https://climatekids.nasa.gov/ and play games, watch videos and learn more about climate change.

-Reading about climate challenged pikas.

ARIZONA SCIENCE CENTER
Never stop wondering.
Never stop imagining.

# Student Handout

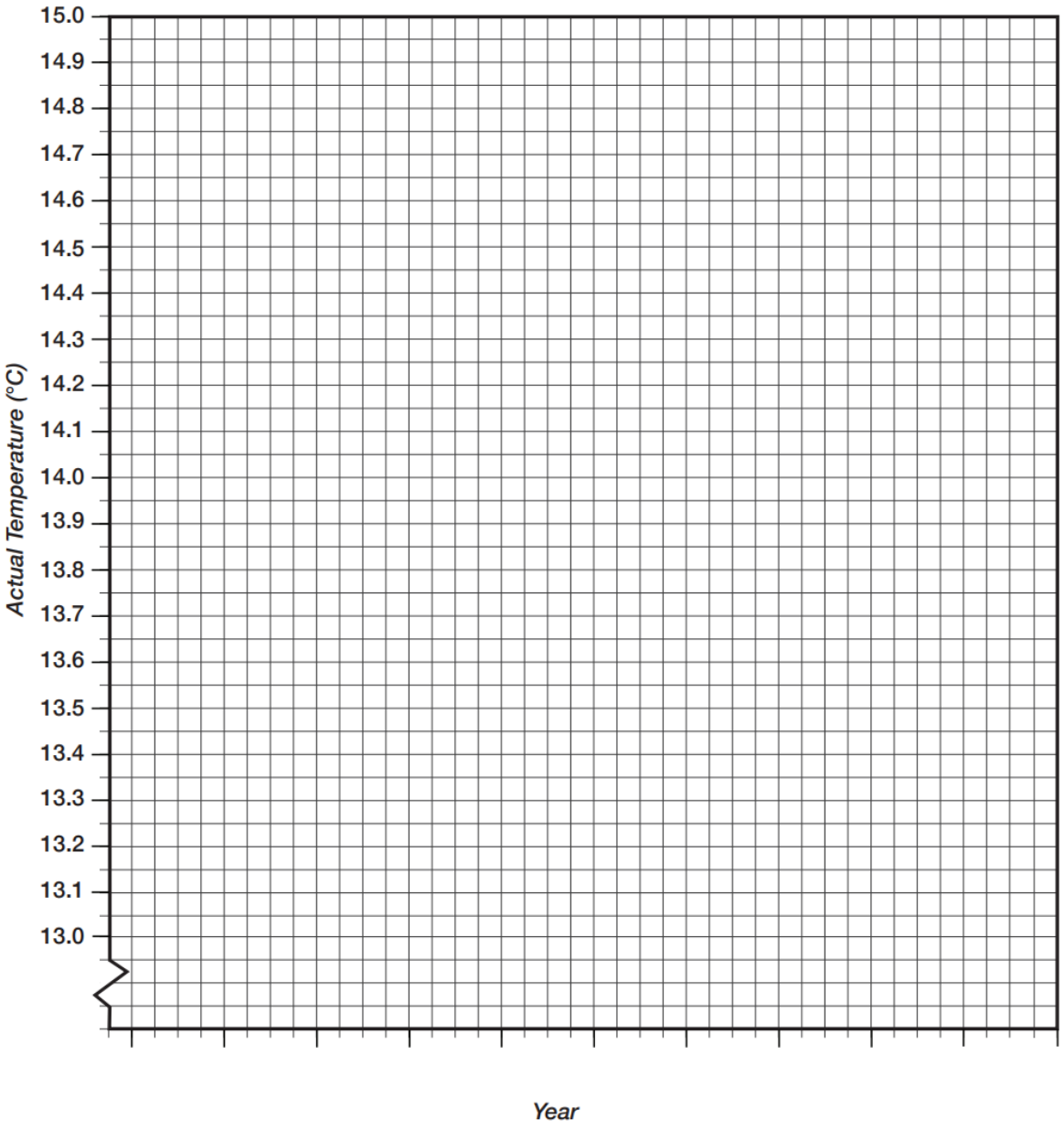
You will be analyzing average temperatures measured on Earth for the past 140 years and then draw some conclusions about the data trends. Data source: https://www.ncdc.noaa.gov/cag/time-series/global/globe/land_ocean/1/12/1880-2016

| Global Annual Mean Temperature Data | | | |
|---|---|---|---|
| **Year** | **Actual Temp.** | **Year** | **Actual Temp.** |
| 1880 | 13.7852 | 1950 | 13.8868 |
| 1885 | 13.6875 | 1955 | 13.7646 |
| 1890 | 13.578 | 1960 | 13.9204 |
| 1895 | 13.578 | 1965 | 13.822 |
| 1900 | 13.8321 | 1970 | 13.9372 |
| 1905 | 13.6826 | 1975 | 13.9034 |
| 1910 | 13.5211 | 1980 | 14.1637 |
| 1915 | 13.5211 | 1985 | 14.0342 |
| 1920 | 13.6895 | 1990 | 14.3328 |
| 1925 | 13.7519 | 1995 | 14.3577 |
| 1930 | 13.7997 | 2000 | 14.4473 |
| 1935 | 13.7608 | 2005 | 14.5585 |
| 1940 | 13.9947 | 2010 | 14.4788 |
| 1945 | 14.071 | 2015 | 14.7998 |

1. Graph the data onto the graphing sheet. Remember to evenly space the years along the horizontal axis.

Jet Propulsion Laboratory
California Institute of Technology

## Graphing Global Temperature Trends
Student Worksheet




2. Observe the trend you graphed above. Is there a trend of global temperature increase or decrease? Has this always been the case over the past 140 years? If not, when did the trend shift?