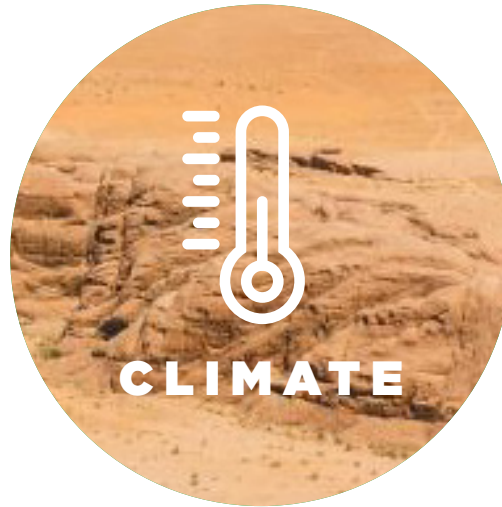


A wide-angle photograph of a desert landscape. In the background, a range of rugged, brown mountains stretches across the horizon under a clear, bright blue sky. The foreground is a vast, sandy desert floor with a prominent, weathered rock formation in the center. The rock formation has a distinct, layered appearance with some vertical cracks and a small, dark opening. The overall scene is brightly lit, suggesting a sunny day.

# 8<sup>TH</sup> GRADE

## STEAM LESSON



# THE TEMPS, THEY ARE A'CHANGIN

## Driving Question:

In what ways do humans impact climate, and how can we reduce that impact to maintain the correct abiotic and biotic factors for other species?

## Materials Needed:

Notebook to record observations, pencil, sketchbook or sheets of paper stapled together

## In this lesson, students will:

- understand that climate is driven by interactions between the sun's energy and our planet's water and winds, and is not static;
- recognize the effect that changing biotic and abiotic factors have on species;
- create a plan to reduce human impact on climate conditions; and
- create a climate change coloring book

## TEKS:

Science: 8.9(A)(B); 8.10(B)(C)  
Art MS 3: 1(A)(B); 2(A)(B); 3(A)(B)



## SPINNING THE COCOON

Watch a weather forecast or pull up a weather report on [Weather Underground](#) or similar website. Examine weather forecasts from previous days and compare it to the actual weather of the day. Ask students how weather is predicted with such accuracy. Show the students a weather map and explain to them that the heat energy from the sun creates convection currents causing warm and cool air movement. As warm air cools and sinks, it creates areas of high pressure. Inversely, as cool air warms and rises, the pressure is lowered. These areas of cool and warm air and high and low pressure as well as humidity, cloud cover and winds drive the weather.

Ask students the difference between weather and climate and write some of the responses on the board. Discuss responses and explain that weather is how the atmosphere is currently behaving whereas climate is how the weather behaves over a long period of time, typically examining data over about 30 years. Weather is generally a temporary condition, although disastrous weather such as hurricanes and tornadoes may cause long term results. Climate change over time has an effect on the long-term biotic (living) and abiotic (nonliving) factors in any given area. This change can either be detrimental, beneficial or neutral to the organisms living in that area. Additionally, due to the convection currents, climate change in one area can affect climate differently in another area.

Write the phrase “global warming” on the board and ask students to come up and write what they associate with that phrase on the board around it. Read over some of the responses as a class and

discuss them. Remind students that greenhouse gases helping keep the Earth warm is known as “The Greenhouse Effect.” Climate can be affected by the amount of greenhouse gases (in particular carbon and methane) present in the environment because these gases act as a barrier preventing the sun’s heat energy from escaping. This is normal and necessary for life, but the increase in greenhouse gases is trapping more heat than in previous years. Tell students that global warming is the common name given to a theory supported by groups of scientists, including the Intergovernmental Panel on Climate Change, which shows that the overall climate of Earth is changing rapidly. As with all theories, there may be scientists who disagree or downplay the effects of this theory. However, what bad can come from trying to remedy this issue? At the very least, we leave the Earth a better place for future generations than we found it.

According to NASA, atmospheric carbon dioxide levels have increased from 280 parts per million to 400 parts per million in the last 150 years.



# METAMORPHOSIS

Students should research and identify one major greenhouse gas contributor such as methane from feedlots, carbon from vehicles or a combination of both from power plants. Students will identify the contributor and research its effects on the local ecosystem. Students will then come up with a viable plan to reduce its contribution to greenhouse gases.

Students might examine the viability of a partnership between farms just outside the suburbs to provide meat for residents rather than purchasing from factory farms, or they might create a proposal to the city for increased bike lanes to reduce reliance on carbon-emitting vehicles. Students should outline their plan in such detail that they would be able to enact their proposal with the correct funding and support. As a conclusion, students will also hypothesize on how reduction in carbon emissions might affect local species.

## UPCYCLE

Reducing greenhouse gases can begin with reducing the current CO<sub>2</sub> levels in the atmosphere. Choose a couple of plants to grow such as peas or algae, and use a CO<sub>2</sub> and O<sub>2</sub> probe to measure the level of respiration in each. Which plants use more CO<sub>2</sub> from the air? Is it feasible to grow more of these plants? How would it affect the species in your local ecosystem to bring these plants in?



## eARTh

Climate change is an issue that scientists have been voicing concern over for years. However, since it is something that happens over a long period of time, it is often hard for people to understand the level of impact. Sometimes if we can't actually see or experience the effects of something quickly, it is difficult to grasp the overall impact. When it comes to raising awareness for an issue, art is a powerful tool. People can relate to images in a way that they cannot relate to words.

In order to raise awareness to the issue of climate change, artist Brian Foo created a climate change [coloring book](#). In it, he addresses issues relating to things such as fossil fuels, global warming and air pollution using images that the viewer colors. Because the act of coloring is slow, this forces the viewer to ponder the information, both in word and image form. Click on the link above and explore the book with your students. Discuss what issues he brings attention to in his work and invite students to talk about what they might change if they were to make such a book.

Now, have the students create their own climate change coloring book. There are many options for creating the actual book. You could get a large spiral bound sketch book and have each student contribute one or two pages to the book, or you could staple or bind a few blank pages together and have each student create their own book.

For their pages, students should include a fact about climate change and draw an image relating to that information. Make sure that students understand that they are making contour drawings so that the viewer has space to color in the parts of the image.

When the book, or books, are finished, display them so that other students and teachers can see them. If possible, make copies of the books, or a few of the pages, so that students can pass them out to other classes to color and learn about climate change.



## COMMUNITY GARDEN & THROUGH THE LENS

A number of grants are available to cities to help them become greener. Visit the Environmental Protection Agency [website](#) and research some of the green infrastructure funding opportunities. Read the details of what they entail and prepare a plan for your city. Create a video using Flipgrid or another recording app featuring students speaking about the various funding opportunities and why becoming greener is critical. Present your video at the next city council meeting to help your city join in the fight to reduce greenhouse gases!



## CAREER CONNECTION

**Climatologist/Meteorologist** - Climatologists and meteorologists study weather patterns and how they affect the planet. They may also test the effects of various weather conditions on structures. These careers require a bachelor's degree, but most in the field hold doctoral degrees.

**Grant Writer** - Grant writers use advanced writing and interpersonal skills to research funding, and to create and submit grant proposals. This career requires a bachelor's degree.

**Biochemist/Biophysicist** - Biochemists and biophysicists study the chemicals and physical aspects of living things. They use their knowledge to try to maintain balance on the planet and investigate the effects of biogeochemical cycles. These careers require a doctorate degree.



## CAREER HIGHLIGHT

James Hansen is a retired NASA atmospheric physicist who has been warning others about the dangers associated with climate change for well over 30 years. He has published many scholarly journals and articles and now uses his knowledge to educate others and testify in court cases related to climate change.

