Science Learning Packet
Grade 6: Earth's Changing Climate, Lesson 12

Suggested science learning activities for SPS students during the COVID-19 school closure.

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Due to the COVID-19 closure, teachers were asked to provide packets of home activities. This is not intended to take the place of regular classroom instruction but will help supplement student learning and provide opportunities for student learning while they are absent from school. Assignments are not required or graded. Because of the unprecedented nature of this health crisis and the District’s swift closure, some home activities may not be accessible.

If you have difficulty accessing the material or have any questions, please contact your student’s teacher.
Earth’s Changing Climate

Lesson 12: Other Climate Change Issues and Celebrations

Investigation Question: What other climate issues are humans trying to solve?
Unit Investigation Question: Why is the ice on Earth’s surface melting?

Lesson 12
Science knowledge about climate change can help us predict the effects of making or not making these kinds of changes. But science knowledge doesn’t actually make the decisions for us about what to do about climate change.

Vocabulary you will use in this lesson:

- atmosphere
- carbon dioxide
- change
- claim
- climate
- climate change
- energy
- evidence
- methane
- model
- stability
- temperature
Lesson 12 – Part 1: Stable Temperature in the Sim

Sim Mission: Stable Temperature: Keep the temperature as stable as possible (not increasing or decreasing) until the time reaches 100 or more.

• Use the Earth’s Changing Climate Simulation and select Human Activities mode.
• Leave population at 7 billion (close to what the world population is today).
• Adjust Combustion per Person, Livestock per Person, Forest Cover, and Gas Capture.
• When you succeed at the mission, make two sketches: (1) the Earth system and (2) graph view showing the stable temperature.
• Do not let the temperature reach 30ºC.
• Answer the question.

<table>
<thead>
<tr>
<th>Sketch: the Earth system</th>
<th>Sketch: graph view</th>
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Other observations:
Why do you think these human activity settings resulted in a stable temperature? If it helps you answer, annotate your sketches.

Lesson 12 – Part 2: Reading “What Are We Doing About Sea Level Rise?”

Read "What Are We Doing About Sea Level Rise?" to learn about how people are preparing for a future with higher ocean levels. As you read, highlight any information that will help you answer the two questions at the end of the article. After reading, use your annotations to help you answer the questions.

Active Reading Guidelines

1. Think carefully about what you read. Pay attention to your own understanding.
2. As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
3. Examine all visual representations carefully. Consider how they go together with the text.
4. After you read, discuss what you have read with others to help you better understand the text.
What Are We Doing About Sea Level Rise?

As the climate on Earth warms, glaciers and other frozen water sources are melting. All that extra liquid water is going into the ocean, causing the water level to rise and cover up some areas that are currently dry land. Scientists predict that global sea levels will rise between 0.9 and 2.1 meters (3 to 7 feet) by the year 2100. If that happens, places near the ocean that have elevations lower than the rising seas will be covered in water. In some very flat areas on the world’s coasts—for example, near Miami, Florida—many people could be forced to find new places to live and work. Rising seas can also affect weather patterns all over the world, causing severe flooding during storms. To prepare for rising sea levels, some coastal cities are already preparing to change and rebuild some areas so that they won’t end up underwater as the nearby ocean rises.

As sea levels rise and more intense weather becomes more likely, many coastal cities have water drainage systems that may not be able to handle the amount of water flowing into them. Some cities are already improving their drainage systems so that more water can drain,
less water backs up in the system, and flooding becomes less likely. Some cities are doing even more and exploring even bigger projects to prepare for sea-level rise.

Some cities are even building floating architecture that will rise with the sea level. The city of Rotterdam, located in the Netherlands, is already slightly below sea level and very flat, and its residents expect that many areas of the city will be underwater within the next few decades. To see how well floating buildings would work for their city, they built three buildings that float in the public harbor. The buildings are accessible by boat and floating sidewalks, and are being used as public spaces that show off green ways of designing and building for the future. The buildings worked so well that the city of Rotterdam plans to build more than a thousand floating homes for people to live in as the water around the city rises.

Other coastal cities, like New York City, are looking into wetland restoration to help protect them from storms and flooding. Wetlands are marshy areas where land and shallow water meet, and they can act like sponges, absorbing extra water before it gets to the cities. Wetlands are flexible ecosystems that can store lots of extra water, absorb energy from large waves caused by storms, and keep dirt from eroding and moving around too much. All of these things can help protect cities from flooding. Like New York, many coastal cities already have wetlands nearby. By protecting wetland areas and restoring the health of damaged wetlands, cities hope to protect themselves from the flooding that comes with sea level rise.

1. What are some things that will happen if global sea levels rise?
2. What are the ways coastal cities are preparing for sea level rise?

3. Why is wetland restoration an effective way to prepare for sea level rise?
Earth’s atmosphere is a layer of gases that surrounds the planet. Some of the gases in the atmosphere block energy from getting into the atmosphere, while others let energy pass through.

A Hole in Earth’s Ozone Layer

Earth’s atmosphere is a layer of gases that surrounds the entire planet. Each gas in the atmosphere interacts differently with energy: each gas may absorb energy, reflect it back to where it came from, or let it pass through.

One of the gases in Earth’s atmosphere is called ozone. Ozone allows some kinds of energy to pass through to Earth, but it absorbs a type of energy from the sun called UVB energy. A layer of ozone about 10 km (6 mi) above Earth’s surface surrounds the planet, keeping UVB energy from reaching Earth’s surface. This layer of ozone protects humans from the harmful effects of UVB energy, such as skin cancer.
Beginning in the 1970s, scientists noticed that the amount of ozone in Earth’s atmosphere was decreasing. The change was taking place because of a chemical reaction between the ozone in the atmosphere and certain types of chemicals made by humans and used in refrigerators, aerosol spray bottles, and fire extinguishers. The ozone layer was becoming especially thin over Antarctica. As the ozone layer became thinner, scientists predicted that humans would see increased rates of skin cancer and other diseases.

The hole in the ozone layer has caused an increase in the amount of UVB light that reaches Earth, which has had health effects for humans and other species. However, UVB light is less than one percent of the energy from the sun, so the increase in UVB caused by the ozone hole is not significant enough to raise global temperature. Global climate change is being caused by energy that can’t escape Earth’s atmosphere, not by extra energy reaching Earth. The hole in the ozone layer is not a cause of global climate change.

There’s good news about Earth’s ozone layer: after scientists began to study the growing hole in the ozone layer and identified the chemicals that were causing it, many countries agreed to ban the use of those chemicals. Companies were required to invent refrigerators, spray bottles, and fire extinguishers that used different chemicals. People stopped releasing the chemicals that were causing the ozone hole, and that solution is working! The hole in the
ozone has shrunk since 1989, when the chemical bans went into effect. The hole in the ozone layer was caused by human activities, but now human activities are causing it to shrink.

The thinning ozone layer was partially caused by the chemicals used in aerosol spray cans. Companies that make those products now use different chemicals to make their spray cans work.