

Learning Activity:

# Good (Carbon) Behavior Game

Activity Type	Board Game
Focus Area	Social and Emotional Learning, Science
Time Required	45–60 minutes

### **Overview**

The Arctic is experiencing the effects of climate change at several times the rate that the rest of the planet is experiencing them. As global warming causes the polar ice caps to melt, animals are losing their sea ice homes, the ocean is becoming more acidic, and sea level rise is threatening shoreline communities. To slow this progression and prevent future damaging consequences, we need to decrease the amount of greenhouse gases we emit. In this activity, students will learn how to demonstrate "good carbon behavior" by playing a game that challenges them to make carbon-responsible decisions. At the completion of this activity, learners should be able to answer the key question: *How can people help protect the Arctic (and the planet) against the effects of climate change in their routine behavior choices?* 

# **Objectives**

### After completing the activity, learners will be able to

- identify the causes and effects of climate change
- evaluate behavior choices that contribute greater amounts of carbon emissions versus those that help reduce emissions
- explain how everyday choices made by people across the country ultimately affect the Arctic and its ecosystems



Melting ice in the Bering Strait, Wales, Alaska

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# **Standards**

#### **Next Generation Science**

- 5-ESS3-1 Earth and Human Activity
  - Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

# **Materials Needed**

- Paper
- Writing utensils
- Printed-out copies of the game board and game cards
- Small items to use as player pieces, such as beans or beads
- Educator's Resource Guide (for reference)

# Vocabulary

- **Climate:** the average condition of the weather at a place, usually over the long term, as exhibited by temperature, wind velocity, and precipitation
- Climate change: a change in climate over time due to natural causes or human activity
- **Ecosystem:** the living (e.g., humans, polar bears, fish) and nonliving (e.g., air, ice, water) components of an area that interact with each other in an interconnected way
- **Energy:** the capacity for doing work; a basic unit in nature that is transferred between parts of a system and results in a physical change
- **Fossil fuels:** fuels (such as coal, oil, and natural gas) formed in the Earth from fossilized plant or animal remains and burned to generate energy; the biggest drivers of climate change
- **Greenhouse:** a structure enclosed (often by glass) and used for the cultivation or protection of plants
- **Greenhouse gases:** gases such as water vapor, carbon dioxide, methane, and nitrous oxide that absorb some of the sun's heat energy and trap it in the atmosphere, making Earth warmer





# **Activity Procedure**

### **Part 1: Teacher Preparation**

- Print off one game board and one set of playing cards per pair of students.
- Fold or tape the playing cards so that the symbol is on one side and the question is on the other.
- Organize and shuffle the cards (ensuring that the white and blue cards are well mixed) into a stack with the symbols facing up.

#### **Part 2: Introductory Discussion**

- As a short warm-up activity, have students draw on a piece of paper one thing that comes to mind when they think of climate change.
- Ask all of the participants to stand.
- Ask for a volunteer to share what they drew and explain why they chose to draw it. Once the individual has shared the drawing, ask that person—along with every other individual who drew the same thing—to sit down.
- Repeat the step above until no student remains standing. Reflect on the drawings—were there any trends? Were there any interesting observations? (e.g., How many students drew causes versus effects? How many drew problems versus solutions? Were there any surprises? Were there differences in opinion?)
- Take a few minutes to discuss causes and effects of climate change by reviewing vocabulary terms with the learners.
  - In terms of climate change causes, students should understand the role that greenhouse gases and primarily carbon play. Carbon is an element that is found in living things and in natural substances such as coal and oil. When carbon is burned (e.g., to generate energy), it collects in our atmosphere and creates a thick blanket around the planet. This traps the sun's heat and warms Earth like a greenhouse, hence the terms "greenhouse effect" and "greenhouse gases."
  - When discussing how the effects of climate change differ around the world (e.g., warming temperatures, increased frequency and intensity of storms and disasters such as floods and droughts), ask the learners, Why do you think the Arctic is affected by climate change more than other regions? Use the information found in the Educator's Resource Guide to help support this discussion.



- a. the amount of daily daylight is changing. (-2)
- b. homes are being damaged by storms and there is less food available. (+2)



At the completion of this activity, students should be able to answer the key question.

**KEY QUESTION:** How can people help protect the Arctic (and the planet) against the effects of climate change in their routine behavior choices?

#### Part 3: Activity

- Explain to learners that to help slow the progression of climate change, we must reduce our greenhouse gas emissions. To test their knowledge of what actions and choices will best achieve that, they will be playing a game that challenges them to choose the healthiest options for the planet. To move forward in the game, participants will have to select an option that demonstrates "good carbon behavior," meaning that it is better for the environment because it results in fewer emissions.
- Distribute a game board, two player pieces, and a set of playing cards to each pair. Explain the directions to participants:
  - Have each of the two players place their playing piece at the start line and determine which participant will pull a card first (the other player will read it).
  - Each of the two participants will take turns either pulling a playing card from the pile or reading the question to their peer without their peer seeing it.
  - Each card contains a multiple-choice question with answer choices that are worth different amounts of spaces to move along the game board.

□ If a white card is drawn:

- The partner, as opposed to the player who drew the card, will read aloud the multiple-choice question, along with the three options for an answer.



- The person reading the question should not reveal to their partner the value of each answer.

A flock of geese on autumn tundra near Utqiagvik, on Alaska's North Slope

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- Once the player provides the answer, the partner reading the card will then reveal what each option was worth and inform the player how many spaces they may move their piece along the board.
  - The answer that is the best choice for the environment is worth advancing two spaces on the board, the answer that is an acceptable choice is worth advancing one space, and the answer that is not a good choice is worth zero, meaning that the player will not advance on this turn.
- □ If a blue card is drawn:
  - The questions on the blue cards relate to the Arctic and how the region is experiencing climate change more intensely than the rest of the world.
  - The partner will read aloud the multiple-choice question, along with two options for answers—one is right and the other is wrong.
  - The person reading the question and the answer choices should not reveal to their peer the value of each answer.
  - To emphasize the magnitude of climate change impacts in the Arctic, these questions have more at risk; players who choose the correct answer may advance two spaces. However, an incorrect answer means that the player must move back two spaces.
- The pair of players will alternate roles of reader and answerer; the first player to reach the finish line of their game board is the winner.

#### Part 4: Reflection and Assessment

- So that learners understand why certain answer options were considered better choices than others, distribute copies of the (included) post-activity student handout. The handout includes a chart with a statement relating to each of the questions. Within each fact is a set of parentheses with three statistical options; participants should select which numerical value they feel is correct by circling or highlighting it. You may choose to use this handout as a follow-up individual assignment, a task to be completed with game partners, or to read aloud as part of a group discussion. Answers are included.
- Conclude the activity and tie it back to the key question by either discussing the following in small groups or having students respond through a short writing assignment.
  - Explain in your own words why the questions on the blue cards relating to the Arctic had greater consequences if you answered them incorrectly.
  - Why would human actions far from the Arctic be felt more intensely within the Arctic?



# **Extended Learning Options**

- Encourage learners to create and sign a pledge that commits them to at least one action that can help reduce the impacts of climate change. This could be something they do at school or at home, set as a goal for them to achieve.
- Have students complete a research project on how their local area is being affected by climate change. Encourage them to interview long-term residents about the changes they've witnessed in the environment, then write letters to local representatives about the urgency in taking action to mitigate the climate crisis, for the region and the Arctic.
- For a fun way to assess student comprehension on this topic and others associated with the Arctic, check out the Wild Classroom Kahoot! Collection *Habitat spotlight: the Arctic*.

### **Additional Resources**

You can use the information found at the following links to enhance your discussion with the class, or you may want to share some links directly with learners if you determine that they are grade-level appropriate.

- Web article: Fight climate change by preventing food waste
- Webpage: Six ways loss of Arctic ice impacts everyone
- Webpage: Green Tips
- Web article: <u>5 ways to help the Arctic as the planet warms</u>
- Web article: <u>A Changing Arctic</u>
- Webpage: <u>Climate Change</u>
- Webpage: What You Can Do to Fight Climate Change
- Webpage: Growing underwater noise in the Arctic puts whales and other animals at risk
- Webpage: Live Green: Energy Efficiency
- Webpage: Seven tips for an earth-friendly holiday season

For more fun classroom activities with a focus on wild species and conservation, visit wildclassroom.org.

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Good (Carbon) Behavior:

Game Cards

<ul> <li>Animals of the Arctic, such as polar bears and walruses, are heavily affected by climate change because</li> <li>a. they're losing their sea ice habitat. (+2)</li> <li>b. intense storms are altering ocean currents and making it more challenging for them to swim. (-2)</li> </ul>
<ul> <li>People of the Arctic are heavily affected by climate change because</li> <li>a. the amount of daily daylight is changing. (-2)</li> <li>b. homes are being damaged by storms and there is less food available. (+2)</li> </ul>
Because of climate change, the ice in the Arctic is melting at a faster rate and is no longer able to a. reflect heat back into space and keep us cool. (+2) b. provide nesting grounds for puffins and terns. (-2)



Good (Carbon) Behavior:

Game Cards

<ul> <li>Underwater Arctic animals such as corals are heavily affected by climate change because</li> <li>a. the water is warmer, and they are unable to reproduce. (-2)</li> <li>b. the water contains more carbon, which makes it more acidic. (+2)</li> </ul>
<ul> <li>Melting of sea ice causes an increased risk of pollution in the Arctic because</li> <li>a. less ice means more open ocean for ships to travel through, bringing harmful pollutants and creating more noise pollution. (+2)</li> <li>b. more people are becoming farmers, instead of fishers, and using fertilizers, which contaminate waterways. (-2)</li> </ul>



Next to each card found within the game (left column) is a sentence containing information about how that behavior contributes to climate change, with three options, in parentheses, for completing the sentence correctly. Circle or highlight the correct choice.

	Artificial lighting accounts for <b>(22, 33, 44)</b> % of electricity use in office buildings. Make it a habit to turn off the lights when you're leaving any room for 15 minutes or more and use natural light when you can.
	Washing your clothes in cold or warm instead of hot water can prevent as much as (350, 500, 1000) pounds of carbon dioxide from being emitted per year.
	Walking or biking not only saves on carbon emissions but also is great for your health. Carpooling just once a week can shrink the amount of carbon you produce by <b>(20, 35, 50)</b> %.
Ð	Annually, the US uses <b>(1, 10, 100)</b> billion plastic bags, consuming about 12 million barrels of oil. Less than 1% of all plastic bags are recycled. Reusable bags can help reduce the number of plastic bags that you use.
	Generating enough electricity to cook for an hour in a standard electric oven creates 2.7 pounds of carbon dioxide emissions. Microwave ovens use around <b>(35, 50, 75)</b> % less energy than conventional ovens. After you've finished eating what you've cooked, make sure to save or compost your leftovers! In the US alone, the production of food that is lost or wasted generates the equivalent of 32.6 million cars' worth of greenhouse gas emissions.
	Heating and air conditioning represent nearly <b>(1/4, 1/3, 1/2)</b> of all energy consumed at home. Moving your thermostat down just two degrees in winter and up two degrees in summer could prevent about 2,000 pounds of carbon dioxide emissions per year.
(+ ÷)	Many idle electronics use energy, even when switched off, to keep display clocks lit and remote controls working. TVs, video games, stereos, and computers can still use up to <b>(40, 60, 80)</b> % of power, even when on "stand by" mode. Switch off power strips and unplug electrical devices when you're not using them.
	When wrapping gifts, avoid plastic ribbon and tape and foil-backed papers or those with glitter—all of which aren't recyclable. Try to use reusable packaging or at least use wrapping paper made from recycled or FSC <sup>®</sup> (Forest Stewardship Council <sup>®</sup> )-certified paper. Recycling 1 ton of paper saves ( <b>3000</b> , <b>5000</b> , <b>7000</b> ) gallons of water, 3 cubic yards of landfill space, and 4,100 kilowatt-hours of electricity. You can also help by planting a tree; on average, a tree can absorb 1 ton of carbon dioxide over its lifetime.
	Beef production has a big effect on climate change due to emissions of greenhouse gases such as methane, nitrous oxide, and carbon dioxide. Livestock account for up to <b>(5, 10, 20)</b> % of global methane emissions associated with human activities. Dairy cows also add a lot of greenhouse gases to the atmosphere.





	In North America, fruits and vegetables travel an average of <b>(500, 1500, 2500)</b> miles before reaching your plate. Buying fresh, local food eliminates the long distances traveled and preserves nutrients and flavor.
	Letting your faucet run for five minutes uses about as much energy as a 60-watt lightbulb consumes in 14 hours. A full bathtub requires about <b>(70, 80, 90)</b> gallons of water, while taking a five-minute shower uses only 10 to 25 gallons.
	Globally, commercial air travel accounts for around 2.5% of carbon dioxide emissions from fossil fuels. One fully occupied bus can replace <b>(35, 57, 86)</b> single-occupant cars, and one fully occupied train can replace up to 1,500.
Le L	Polar bears and walruses depend heavily on Arctic sea ice for feeding and resting. As sea ice melts, walruses lose their homes and polar bears spend more time on land, causing higher rates of conflict between people and bears. Just one polar bear population in northeast Alaska has already dropped by <b>(40, 60, 80)</b> %.
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Without sea ice to help buffer shorelines, up to <b>(5, 8, 16)</b> feet of coastline are eroding away every year in some areas of Alaska. This causes storm surges to move further inland, flooding communities and damaging property. As climate change affects populations of whales, walruses, caribou, and berries, local people are also losing their traditional food sources.
	Sea ice reflectivity helps regulate the amount of sunlight that interacts with the Arctic's surfaces and the area's temperatures. As sea ice disappears, the dark ocean surface is exposed, absorbing the sunlight instead of reflecting it, allowing much more heat to enter the Arctic. Sea ice in the Arctic has already declined by more than <b>(26, 43, 57)</b> % since 1979.
	With all of the greenhouse gases collecting in the atmosphere, the ocean is absorbing more carbon, which causes acid to form and lowers the pH of seawater. Acidic seawater affects all marine life but especially animals such as coral, plankton, and crustaceans. If we continue on the path that we're on, the pH of the ocean could reach the lowest, most acidic level it's been in <b>(5, 25, 50)</b> million years.
	Shipping in the Arctic is on the rise as sea ice melts and the pressure to access Arctic resources intensifies. More ships means increased risks to Arctic ecosystems and wildlife, from heavy fuel oil spills to air and underwater noise pollution. In just <b>(7, 9, 11)</b> years, underwater noise has doubled in some areas of the Arctic.



**Good (Carbon) Behavior:** Post-activity Student Handout **Answer Sheet** 

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