



Learning Activity:

What's the Connection?

Activity Type	Modeling cause and effect
Focus Areas	Science, social studies
Time Required	45–60 minutes

● Overview

In a rapidly modernizing world, our dependence on energy continues to grow with the population. Unfortunately, the widespread generation of power from some sources comes at a high cost. Students will explore the connection between how the world's energy use can affect a polar bear's survival, by creating chain-link models. This will demonstrate the cause-and-effect relationships of climate change and its impact on the Arctic environment. Through this activity, students will learn how their actions, both positive and negative, can impact areas and species in faraway places.

● Objective

At the completion of the activity, students should be able to:

- Define vocabulary related to energy and climate change.
- Name examples of energy and describe how it is transferred.
- Relate our energy use to declining polar bear populations.
- Identify alternative behaviors that could help fight climate change and reduce the risks to polar bears and other species.





● Subject and Standards

Next Generation Science Standards

- 4-ESS3-1 Earth and Human Activity
 - Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- 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.
- 5-PS3-1 Energy
 - Use models to describe that energy in animals’ food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.

C3 Framework for Social Studies State Standards

- D2. Eco.1.3-5: Compare the benefits and costs of individual choices.
- D2. Eco.3.3-5: Identify examples of the variety of resources (human capital, physical capital, and natural resources) that are used to produce goods and services.

● Materials Needed

- [Polar Bear Educator’s Resource Guide](#)
- Strips of paper large enough to write on and glue together (construction paper recommended)
- Pen or pencil
- Glue sticks
- Copies of the “My Energy Saving Plan” student worksheet included in this activity (optional)
- Copies of puzzle included in this activity (optional)
- Tape (optional)



● Vocabulary

- **Climate change:** a change in climate over time due to natural causes or as a result of human activity
- **Energy:** the capacity (as of heat, light, or running water) for doing work
- **Fossil fuels:** formed from fossilized remains of prehistoric organisms (most common are coal, oil, and natural gas) and burned to generate energy; the biggest drivers of climate change
- **Greenhouse gases:** gases such as water vapor, carbon dioxide, methane, and nitrous oxide; they absorb some of the sun's heat energy and trap it in the atmosphere, making Earth warmer
- **Habitat:** a natural environment in which plants and animals live, breed, and get their food, water, and shelter
- **Nonrenewable resource:** resource that cannot be replaced (at the same rate) after it is used (examples are coal, oil, and natural gas)
- **Positive climate feedback loop:** a cycle that accelerates a temperature rise and an overall warming trend
- **Renewable resource:** resource that can be replaced by nature (examples are solar, wind, water)
- **Turbine:** an engine that consists of a series of blades spun around by the pressure of a fluid (such as water, steam, or air)





● Activity Procedure

Part 1: Introduction and Preparation

- For this activity, students should know the basics of energy. Energy can be found anywhere there is motion, light, heat, or sound. Energy can come in many forms and can continuously change form. Have students brainstorm things they use or things they do every day that require energy. Examples could include using the bus to get to school, playing sports, or watching television.
- Now ask students where that energy comes from. All energy begins with the sun; however, that energy will go through many different transitions before becoming a different form of power. Provide and display relatable examples that will challenge students to trace energy conversions. Since so many commonly used devices require electricity, an easy example to relate to students might be something they plug in to use:

– Turning on a lamp in your house → electricity → burning coal → plants/animals → sun

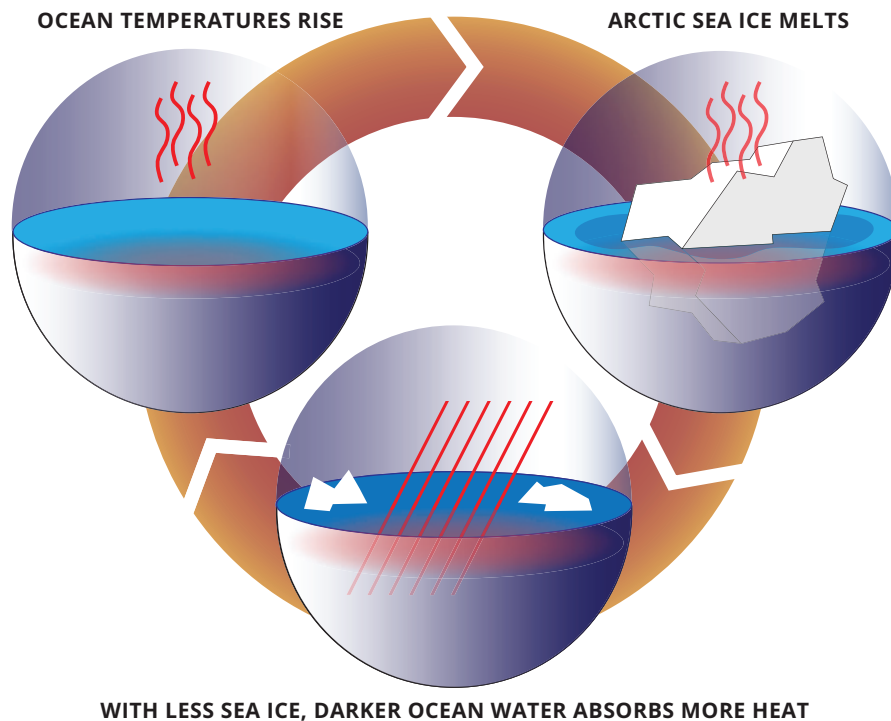
- To turn on the lamp, you need to plug it into the electrical outlet in your house. Electricity is often generated by burning coal to power a turbine that sends the electrical energy to your neighborhood. Coal has stored energy that was formed over millions of years by combining heat and pressure with fossilized plant and animal matter, which originally derived their energy from the sun.





POLAR BEARS

- Unfortunately, many ways humans process energy are negatively impacting our planet. Discuss the process of climate change, using the definitions provided in the vocabulary section of this activity and the following information:
 - Greenhouse gases, such as carbon dioxide, trap heat in the atmosphere and regulate our climate. These gases exist naturally, but humans can impact their levels, such as by adding more carbon dioxide by burning fossil fuels for energy (coal, oil, and natural gas) and by clearing forests (the stored carbon dioxide inside of trees gets released into the atmosphere when the trees are cut down). Greenhouse gases act like a blanket. The thicker the blanket, the warmer our planet becomes.
 - The release of greenhouse gases from the burning of fossil fuels and other sources is causing temperatures in the Arctic to warm at twice the rate of the rest of the world.
 - In the Arctic, the warmer ocean temperature is causing more sea ice to melt. With more sea ice melting, the Arctic is experiencing a positive climate feedback loop.
 - Arctic sea ice and snow reflect a lot of the sun's energy back into space. This helps prevent the Earth from becoming overheated. As humans release more greenhouse gases into the atmosphere, water temperatures rise and more sea ice melts, opening up more ocean water. The dark water of the ocean, instead of reflecting the sun's energy like ice does, absorbs the energy, which causes temperatures to continue to rise and more sea ice to melt.





- Using polar bears as an example, discuss with students what kind of ripple effects this continued loss of sea ice would have on members of the Arctic community. Polar bears rely on sea ice for their survival; it is where they rest, breed, and feed. With sea ice levels continuing to diminish, polar bears are losing their habitat and are at risk of extinction.

Part 2: Activity

In this activity, students will create cause-and-effect chains that show how their energy use can connect with climate change impacts affecting the polar bears and their environment.

- Assess student understanding by having them summarize in their own words the causes of climate change and its effects on sea ice.
- Have students work individually or in pairs, and give them strips of paper and a glue stick. They will be forming interconnected links that start with something they use that requires energy and end with impacts to polar bears. In their chain, they should create as many links as they need, but encourage them to try and include at least five. It may be helpful for them to write their steps out on a scrap piece of paper first.
- For their first link, students should write one item they use that requires energy. Examples include television, video games, lights, and cars. The next link in their chain should be where that device gets its energy. Students will continue to trace it back, thinking of cause and effect, and including links relating to climate change such as the burning of fossil fuels, greenhouse gases, the melting of sea ice, and ultimately the polar bears losing their habitat/food.

- Example:

Video games → Electricity → Burning fossil fuels → Releases greenhouse gases → Makes ocean temperatures rise → Melts sea ice → Polar bears lose their home

- When they believe their links are all in order, they will glue the strips of paper around each other, creating a chain. The first link should be glued to itself (with writing on the outside) to create a ring; each of the other links will go around the step directly before it, before it is glued.
- Once this is completed, have each individual or pair share their chain by describing the correlation between an item they use or activity they engage in and the impact on polar bears.



Part 3: Discussion and Assessment

- Review how the world’s massive appetite for fossil fuels causes climate change and has a huge effect on polar bears and the Arctic. Discuss how the world’s continuously increasing population and rising standard of living are causing an increased need for these products (electricity, fuel), which is causing the rate of climate change, and therefore the threat to polar bears, to increase. Students should recognize the cause-and-effect patterns and understand that all of these actions are related, so if things continue in this way, the outcomes will only worsen.
- As a class, discuss alternatives to satisfy the need for energy. Compare and contrast renewable and nonrenewable resources using the definitions and examples provided. Have students brainstorm the advantages of using renewable resources. Also, have them think of ways that they can avoid wasting energy. Examples include turning off lights and video games when not in use, unplugging phone and tablet chargers, and adjusting thermostats. Other examples can be found in the “What Kids Can Do” section of the [Polar Bear Educator’s Resource Guide](#).

● Extended Learning Options

- Have students complete the “My Energy Saving Plan,” included in this activity, to help stay accountable at home for saving energy and slowing climate change. Remind them that conserving energy includes not only being conscious of current practices to avoid being wasteful, but also choosing to use renewable sources. An example could include talking to members of your school or family about solar energy and its benefits.
- To help illustrate causes and effects of saving energy, print copies of the attached puzzle on paper or card stock, cut along the lines of the puzzle, and then scramble the pieces. Give each student a set of puzzle pieces, and challenge students to think of nine ways in which they or their community could reduce the amount of energy they use. Ideas could be something like riding their bike instead of driving in a car, unplugging devices such as computers when not in use, or installing solar panels. After each student has come up with nine ideas, have them write each idea on the back of the puzzle pieces. Once this is done, have the students put the puzzle together and tape it into place. The image—a polar bear living happily amid plentiful amounts of sea ice—represents the effect.



- If available, use a tablet or smartphone to download the [WWF Together app](#). Encourage students to explore the polar bear segment, which contains interactive modules to help them better visualize the impacts of climate change on polar bears.
- Start a class fundraiser to protect polar bears and other wildlife and their habitats, using WWF's online fundraising tool, Panda Nation. Learn more at [pandanation.org](#).

Additional Background Info

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

- **Video:** [Climate Change & Arctic Warming](#)—outlines how the melting of the Arctic region is affecting species
- **Article:** [Polar Bears and Climate Change](#)—a short overview of how polar bear populations are affected by climate change
- **Article:** [Record low sea ice impacts polar bears](#)—a WWF researcher's firsthand account witnessing the effects of climate change on polar bears
- **Video:** [Remember when?](#)—touching segment on the importance of nature conservation
- **Article:** [Lack of winter sea ice disrupts life in the Arctic](#)—impacts of one of the lowest-recorded yearly levels of sea ice in the Arctic
- **Article:** [Climate change puts the Pacific walrus population on thin ice](#)—how the receding sea ice in the Arctic is impacting walruses
- **Article:** [Why are glaciers and sea ice melting?](#)—outlines the effects melting glaciers and sea ice have on species and communities around the world



For more fun classroom activities with a focus on wild species and conservation, visit [wildclassroom.org](#).



POLAR BEARS

Name: _____

● MY ENERGY SAVING PLAN

Using what you've learned about how using energy impacts polar bears, think of as many ways you can to save energy at your home or school. Make a checklist of ways you can save energy, and post this list somewhere you will see it each day to remind you!

To save energy and help polar bears, I will...

- 1) _____

- 2) _____

- 3) _____

- 4) _____

- 5) _____

- 6) _____

- 7) _____

