



Heat Trapping Blanket: The Narrative

5th grade unit

Created by Emily Miller, Student of Alaska Pacific University, Master of Science in Outdoor and Environmental Education Candidate

Transfer Goals:		Essential Questions:
<p><i>Students will be able to independently use their learning to:</i></p> <ul style="list-style-type: none"> • Create a connection to a global conversation to engage within their community • Understand global issues to communicate, evaluate, observe, and explain responses • Cultivate confidence in creating solutions when challenged with a multi-level problem 		How does climate change work?
Standards:	Materials:	Objectives:
<p>CCSS:</p> <p>CCSS.ELA-LITERACY.W.5.3 CCSS.ELA-LITERACY.SL.5.2</p> <p>NGSS: 5-ESS3-1, 5-ESS2-1, 5-ESS2-2.</p>	<ul style="list-style-type: none"> • Sticky Notes • At least 4 blankets 	<p><i>Students will know:</i></p> <ul style="list-style-type: none"> • Causes of climate change • Some actions to positively impact climate change <p><i>Students will be skilled at:</i></p> <ul style="list-style-type: none"> • Modelling and demonstrating the heat trapping blanket metaphor • Listing ways climate change is negatively affecting polar bear populations • Using individual and collaborative informed decision making to design communication-based solutions to climate change <p><i>Students will understand that:</i></p> <ul style="list-style-type: none"> • Climate change affects polar bears and their environment
Description:		Vocabulary:
<p>This lesson is a short introductory activity to a simple function of climate change by using the “heat trapping blanket” metaphor. This lesson should be used alongside other lessons, to ensure the basics of climate change are</p>		<p>Atmosphere: The gases that surround the Earth</p> <p>Climate Change: A long-term change in global temperatures and other characteristics</p>

understood before digging deeper.

of the atmosphere

Carbon Dioxide (CO₂): A colorless, odorless gas

Emission: A product of something, usually a discharge from burning something

Kingdoms of Life: 5 groups to describe all living things

Narrative: A spoken, written, or drawn account connecting multiple events or topics to create a story

Duration: Multi Day Lesson: 1-3 hours

Lesson Plan

Engage:

- Show this video, A Life Tied to Sea Ice, to introduce the heat trapping blanket metaphor
<https://www.youtube.com/watch?v=HYXvtQzmiDU>

Explore/Explain:

Heat Trapping Blanket:

- Begin by asking for a volunteer. Explain that this volunteer is now planet Earth.
 - Explain that there are 5 groups of living things on Earth! Ask students to tell you those 5. As students answer, place the Kingdoms of life onto the "Earth".
 - Animals
 - Plants
 - Algae
 - Bacteria
 - Fungi
 - Once all of the 5 kingdoms are on Earth, introduce the idea that the volunteer's clothing is the Earth's atmosphere. It keeps the living organisms healthy and comfortable so that everything can work in balance.
- Explain that when we burn fossil fuels like coal, gas, and oil for energy, we are emitting carbon dioxide into the atmosphere, creating a blanket-like effect on Earth. The more carbon dioxide released, the thicker the blanket gets, making the climate warmer.
- Ask students to think of ways that humans create carbon dioxide emissions. Ask them to raise their hand. For every example, put a blanket on the Earth.

Examples:

 - Power for lights and heating
 - Gasoline for cars, trains, planes, buses
 - Energy for factories to make things
 - Energy to process food
- After all of the blankets are on the Earth, ask how the Earth is feeling. Warmer or colder? Ask how the 5 kingdoms are feeling. Remind students that we can not change or adapt as fast as the climate is warming. Tell students that we have plenty of solutions to help reduce carbon dioxide in the

atmosphere, or in this case take blankets off the Earth.

- Ask students to think of solutions to take carbon dioxide out of the air, reduce our emissions, or reduce our use of fossil fuels. For every answer, take off a blanket from the Earth.

Examples

- Solar power, hydro, wind, etc.
 - Planting gardens
 - Wear hand-me-downs, multiple-use items to reduce production
 - Talk about it to make other people aware
 - Buy local
 - Public transportation
- Once all of the blankets are off the Earth, ask how the Earth is feeling. Warmer? Cooler? Ask how the 5 kingdoms are doing?

Elaborate:

Narrative Writing:

- Directly after the heat trapping blanket activity, direct students to design a children's storybook or comic strip complete with illustrations using the heat trapping blanket metaphor to explain how climate change is affecting polar bears. Make sure they include these pieces in their story or comic book. This will be a Review, Write, Revise, Rewrite process.
 - Heat trapping blanket metaphor
 - Causes of climate change
 - effects on polar bears
 - Solutions to climate change
 - Positive tone

Evaluate:

- Remind students that one of the best solutions to climate change is to spread awareness by communicating. Have each student turn in their piece. Check that their work is accurate and give feedback.
- Give stories or comic strips back to students and allow them to create their final draft using your feedback.
- Once their final draft is finished, have them bring their story or comic book home and read it to at least 3 people.

Extension:

- Lesson: Climate Superheros-Carbon Dioxide Exploration

Adaptation:

- Making the sharing of the narrative a competition by communicating with as many people as they can, which could help create confidence in students talking about climate change and solutions

References

- A Life Tied to Sea Ice, Polar Bears International
<https://www.youtube.com/watch?v=HYXvtQzmiDU>



Climate Superheroes— Carbon Dioxide Exploration

5th grade unit

Created by Emily Miller, Student of Alaska Pacific University, Master of Science in Outdoor and Environmental Education Candidate

Transfer Goals:

Students will be able to independently use their learning to:

- Make informed decisions through problem solving and communication
- Cultivate confidence in creating solutions when challenged with a multi-level problem
- Understand global issues to communicate evaluate, observe, and explain responses

Essential Questions:

When is carbon dioxide harmful to the Earth?

Standards:

CCSS:

CCSS.ELA-LITERACY.
SL.5.1

CCSS.ELA-LITERACY.
SL.5.4

NGSS:

5-ESS3-1, 5-ESS2-1,
5-ESS2-2.

Materials:

- Device or climate hero cards
- Coloring utensils
- Paper

Objectives:

Students will know:

- Causes of climate change

Students will be skilled at:

- Linking the Arctic to global systems and how they interact
- Modeling and demonstrating the heat trapping blanket metaphor
- Using individual and collaborative informed decision making to design communication-based solutions to climate change

Students will understand that:

- Climate change affects polar bears and their environment

Description:

This lesson will explore the components of carbon dioxide to better understand aspects of climate change through experiments, creative writing, and drawing.

Vocabulary:

Carbon Dioxide (CO₂): A colorless, odorless gas
Greenhouse Gas: Gasses that trap the earth's heat, which leads to climate change

Duration: 1.5 hours

Lesson Plan

Engage:

- Start this lesson by asking each student to journal for 5 minutes describing what they know about climate change.
 - Encourage students to make educated guesses.

Explore:

- Share this video to give the groundwork of why sea ice is important
<https://www.youtube.com/watch?v=HYXvtQzmiDU>
- During the video ask students to keep a list of who a warming climate may impact. Make sure to share those answers. Allow students to make the connections that demonstrate humans are being affected.

Explain:

- Replay the “A Life Tied to Sea Ice – Preserving a Future for Polar Bears & People” to help students understand the basics.
 - Play 00:38-01:17
<https://www.youtube.com/watch?v=HYXvtQzmiDU>
- Begin the Carbon Dioxide Exploration
- This can be a demonstration or group project.
 - Before beginning the experiment, make sure to clearly emphasize the presence of CO₂ within the bottle of seltzer water and that both bottles represent the earth. One bottle with Regular CO₂ (tap water) and the other with Rampant CO₂ (seltzer). To guide understanding, label the bottles Regular and Rampant.
 - Begin with two, 2-liter bottles. Fill one bottle halfway with seltzer water and fill the other bottle halfway with tap water. Seal the bottles with caps immediately. Place a lamp in front of both bottles. Make sure both bottles are the same distance away from the lamps, but not too far (about 1.5 feet).
 - Allow the bottles to sit about an hour or so in front of the lamp. Once the bottles have been heating up for about an hour or more, use a touchless thermometer to take the temperature of the air section of each bottle. Record the temperatures on the board in a way that students can see.

Elaborate:

- Follow up the experiment with these questions:
 - How might a heat trapping blanket on the Earth change the Earth's climate?
 - How might this change the Arctic?
- Introduce other gases that contribute to the heat trapping blanket. Let students explore the “Meet the Greenhouse Gases” on NASA <https://climatekids.nasa.gov/greenhouse-cards/>
 - If your students do not have access to a tablet or computer, these cards are accessible for printing.

Evaluate:

- Give students 10 minutes to create their own superhero that helps fight the CO₂ villain. Remind students that the superhero must have the power to stop Rampant CO₂.
 - Let students get creative, name the superhero!
- Share what they have created and explain why they chose those powers and qualities.

Extension:

- Lesson: Heat Trapping Blanket, The Narrative from the 5th Grade Unit

References

- [A Life Tied to Sea Ice, Polar Bears International](https://www.youtube.com/watch?v=HYXvtQzmiDU)
<https://www.youtube.com/watch?v=HYXvtQzmiDU>
- Lesson 1: Carbon Concerns, National Geographic
<https://ceee.colorado.edu/sites/default/files/2020-03/Climate%20Resiliency%20MS8%20-%20Teacher%20Guide.pdf>
- Meet the Greenhouse Gases, NASA's Climate Kids
<https://climatekids.nasa.gov/greenhouse-cards/>



Energy Island

5th grade unit

Created by Emily Miller, Student of Alaska Pacific University, Master of Science in Outdoor and Environmental Education Candidate

Transfer Goals:		Essential Questions:
<p><i>Students will be able to independently use their learning to:</i></p> <ul style="list-style-type: none"> • Apply environmentally minded actions through behavior changes • Create a connection to a global conversation to engage with in their community • Understand global issues to communicate, evaluate, observe, and explain responses • Make informed decisions through problem solving and communication • Cultivate confidence in creating solutions when challenged with a multi-level problem 		<p>How can we help to positively impact climate change?</p>
Standards:	Materials:	Objectives:
<p>CCSS:</p> <p>CCSS.ELA-LITERACY.SL.5.1</p> <p>CCSS.ELA-LITERACY.SL.5.4</p> <p>CCSS.ELA-LITERACY.SL.5.5</p> <p>CCSS.ELA-LITERACY.W.5.7</p> <p>CCSS.ELA-LITERACY.W.5.9</p> <p>NGSS:</p> <p>5-ESS3-1</p>	<ul style="list-style-type: none"> • Poster • Coloring utensils • Other materials may depend on projects 	<p><i>Students will know:</i></p> <ul style="list-style-type: none"> • Some ways to positively impact climate change <p><i>Students will be skilled at:</i></p> <ul style="list-style-type: none"> • Using individual and collaborative informed decision making to design communication-based solutions to climate change <p><i>Students will understand that:</i></p> <ul style="list-style-type: none"> • There are actions they can take to impact climate change
Description:		Vocabulary:
<p>This lesson will explore a true story of innovative energy independence to spark interest and action in real world, community solutions. Through project-based learning, this lesson will let students explore solutions through creativity and self-guided</p>		<p>Energy Independent: Being able to create as much energy as needed to meet the demands of the community</p> <p>Renewable Energy: Energy that is collected from a resource which is naturally replenished</p>

research. The projects will use measurements, data, and other sampling methods to create and implement an action plan for reducing their classroom's carbon emissions.

on a human time scale

Duration:
Main lesson: 2-3 hours
Project: 2 weeks

Lesson Plan

Engage:

- Begin Lesson by listening to "Energy Island"
<https://www.youtube.com/watch?v=yeRddjwDEhw>

Explore:

- Pose these questions on the front board and create a class discussion
 - What does it mean to be energy independent?
 - Why do you think the island of Samso is an ideal place to be energy independent?
 - Do you think using wind energy would work for every place on earth?
 - Does every place on Earth have access to renewable energy?
 - Did Soren Hermanson make the island of Samso energy independent alone?

Explain:

- Remind students that the story of Energy Island is a true story. Show them the video of Soren Hermanson touring Samso Island
https://www.youtube.com/watch?v=77jp_xlOawU

Elaborate:

- Separate students into project teams. Each team will focus on one aspect of carbon emissions in the classroom. For example, garbage, food waste, electricity, and transportation. Each team will research information such as the length of time the lights are on throughout the day, the weight of the trash, the amount of paper recycled, how many students take the bus, the number of devices plugged in past full charge, etc.
- Once the team has decided what they are monitoring, they must construct a plan and collect data for 1 week. Make sure students plan ahead of time how they will measure and monitor their topic and create tables and data collection plans prior to starting the monitoring.
- Allow students to collect data for 1 week.

Evaluate:

- After 1 week of data collection, students will collaborate as a team to construct an action plan to reduce carbon emissions correlating to their research, i.e. keep lights off during arrival and dismissal, compost bins, a hand-me-down drive, etc. Depending on learning levels, you can incorporate fractions at this point of the project and ask each group to come up with a projected percentage that would be reduced by the action.
- Instruct each team to create a poster and present on their project and a solution to reducing carbon emissions in the classroom. Be sure to let students know this is a persuasive poster/presentation, convincing the class that their action plan is obtainable in the classroom. After team members have presented, allow the class to vote on which action plan they feel they can accomplish as a group. Once they have voted, continue with the one action plan for another week and keep track of the measurements to see if the projected reduction rate was accurate. This action can also be implemented throughout the rest of the year.

Extension:	Adaptation:
<ul style="list-style-type: none"> • Get other classes involved! After each class has voted on their change individually, you could take this project higher to the school level and create a competition between classes to present each action plan, with data, to the principal and see if there is an action plan your classes could implement throughout the entire school! 	<ul style="list-style-type: none"> • If time is limited, you can set parameters on projects, guiding students towards a single action plan.
References	
<ul style="list-style-type: none"> • Energy Island, Allan Drummond https://www.youtube.com/watch?v=yeRddjwDEhw • Samso: The green island, Al Jazeera https://www.youtube.com/watch?v=77Jp_xlOawU 	



Icy Innovations

5th grade unit

Created by Emily Miller, Student of Alaska Pacific University, Master of Science in Outdoor and Environmental Education Candidate

Transfer Goals:		Essential Questions:
<p><i>Students will be able to independently use their learning to:</i></p> <ul style="list-style-type: none"> • Make informed decisions through problem solving and communication • Cultivate confidence in creating solutions when challenged with a multi-level problem 		Why are innovations important to research?
Standards:	Materials:	Objectives:
<p>CCSS: CCSS.ELA-LITERACY.W.5.9, CCSS.ELA-LITERACY.W.5.7</p> <p>NGSS: 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3</p>	<ul style="list-style-type: none"> • Paper • Writing utensil 	<p><i>Students will know:</i></p> <ul style="list-style-type: none"> • How innovations lead conservation research in positive (new?) directions <p><i>Students will be skilled at:</i></p> <ul style="list-style-type: none"> • Using individual and collaborative informed decision making to design solutions to climate change <p><i>Students will understand that:</i></p> <ul style="list-style-type: none"> • Research is important to conserving polar bears
Description:		Vocabulary:
<p>This lesson will take a look at current polar bear research. To better understand the conservation of polar bears, students will look at creative solutions by designing research innovations.</p>		<p>Innovation: The act of making changes to something, especially by introducing new methods, ideas, or products</p> <p>Research: To investigate, observe,, and learn more about something to come to a new conclusion, usually to answer a question</p>
		Duration: 1 hour

Lesson Plan

Engage:

- Show students this video on Sea Ice Ecoregions
https://www.youtube.com/watch?v=iaT2SssKc2Q&list=PLtVrwxiz_3tQFJupKJ4-pKLMB75thThWO&index=1

Explore:

- Give students a few minutes to answer these questions in groups
 - Why is research important?
 - How can research help polar bears?
 - What is innovation?
- Discuss answers as a class
- Give a definition for innovation
 - The act of making changes to something, especially by introducing new methods, ideas, or products

Explain:

- Explain that research can guide solutions, action, and conservation
- Remind students that research is constantly changing through new ideas and technology
- Show this video on Polar Bear Tracking to help students understand how Polar Bears International is innovating tools to study polar bears
https://www.youtube.com/watch?v=3CxFfSeggPc&list=PLtVrwxiz_3tQFJupKJ4-pKLMB75thThWO&index=3

Elaborate:

- Separate students into three groups and give each group the same prompt. Remind students that research is always changing and getting better. Ask students to work in a group and design innovations to help Polar Bears International retrieve their equipment.
- Polar Bear Tracking Prompt:
 - Scientists use polar bear tracking to help understand many different aspects of polar bear behaviors, life cycles, and sea ice formation. Polar Bears International and 3M have come up with a new smaller polar bear tracking mechanism that will fasten or stick to a polar bear's fur to replace having to use a large collar. Scientists need you to come up with a solution to their next problem. When the tracking mechanisms are no longer in use, they fall off of the polar bear. The tracking devices are hard to find and the weather can be too harsh to retrieve all of the devices. How can researchers retrieve these devices and reuse them without having to go onto the sea ice to get them?
 - Design innovations to help researchers with their new problems. Include a drawing with labels, and a paragraph explaining how this new innovation will work.

Evaluate:

- Have each group present their innovation.

Extension:

- Polar Bear Tracking Tundra Connections for supplemental learning
<https://www.youtube.com/watch?v=2Ym3gcyR1Ak&t=1523s>

References

- Sea Ice Ecoregions, Polar Bears International
https://www.youtube.com/watch?v=iaT2SssKc2Q&list=PLtVrwxiz_3tQFlupKJ4-pKLMB75thThWO&index=1
- Burr on Fur Polar Bear Tracking, Polar Bears International
https://www.youtube.com/watch?v=3CxFfSeggPc&list=PLtVrwxiz_3tQFlupKJ4-pKLMB75thThWO&index=3