Build THE Change

EDUCATOR GUIDE

ARCTIC ADVENTURES: POLAR BEARS AT PLAY

VIRTUAL FIELD TRIP

OBJECTIVES

Students will:

- Evaluate the benefits and tradeoffs of technology for observation.
- Observe the environment around their school and analyze how humans could better protect it.
- Build a prototype 3-D model of a solution or idea that can help polar bears.
- Create a camera model designed to observe animals in a specific ecosystem.
- Reflect on the skills used in playful design thinking and their application to the engineering design process.

Overview

The Arctic Adventures: Polar Bears at Play Virtual Field Trip will inform and empower students to engage their creativity, imagination, and sense of play to positively impact Planet Earth. As students explore Manitoba's vast tundra, observe polar bears, and speak with scientists, they will gain a deeper understanding of how creative play can inspire technology that is helping to solve environmental problems in the Arctic and around the world.

The pre-field trip activity in this companion guide has been designed to prepare students for the Virtual Field Trip, and the post-trip activities have been designed to encourage students to explore and learn through play, nurturing curiosity and creative problem-solving to better understand our world. You may choose to complete one or all of these activities in your classroom.

National Standards

NEXT GENERATION SCIENCE STANDARDS

- 3–5-ETS1–1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 3–5-ETS1–2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 5–ESS3–1: Obtain and combine information about ways individual communities use scientific ideas to protect the Earth's resources and environment.

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COMMON CORE ENGLISH LANGUAGE ARTS STANDARDS

- CCSS.ELA-LITERACY.CCRA.SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- CCSS.ELA-LITERACY.CCRA.SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

Materials

- Notecards or copy paper cut into small squares
- Copies of the following Activity Sheets for each pair of students:
    - Polar Bear Solutions
    - Citizen Scientist Search
    - Camouflage-A-Camera
- Variety of creative materials for building 3D models, which may include:
    - Small boxes and containers of various sizes
    - Toy blocks
    - LEGO bricks
    - Construction paper and copy paper
    - Bottle caps
    - Reusable cups
    - Aluminum foil and plastic wrap
    - Plastic bands, string, twine, or thread
    - Buttons or beads
    - Items from nature: Leaves, dirt, sand, and twigs
    - Glue and tape
    - Scissors
    - Markers, paint, and paintbrushes, and other drawing materials

Before the Virtual Field Trip

1. Begin by asking students: What is one piece of technology that you have used or seen today?
2. Ask a follow-up question: Can anyone think of how being playful or creative might have led to the invention of this technology?
3. Tell the class that people around the world use technology, that was often born out of a playful and creative mindset, in all kinds of ways. Divide students into groups of four and distribute a stack of notecards to each group. Set a timer for five minutes and challenge groups to write down as many different examples of technology as they can think of (one idea per card).

   Tip: If groups are having trouble, help by giving them broad categories to use as starting points, such as communication, transportation, entertainment, space, or manufacturing.
4. Next, instruct groups to divide their cards into three categories: "Benefit" (for technology that they believe helps the world); "Tradeoff" (for technology that they believe might be intrusive) and "Neutral" (for technology somewhere in the middle).
5. Once groups have sorted their cards, conclude with a full-class discussion around the activity:
   - What problems do the "Benefit" cards solve?
   - Why did you put some cards in the "Tradeoff" pile?
   - Why do you consider some technologies to be "Neutral"?
   - Were any cards especially hard to place? Why?
6. Once all groups have shared, tell the class that they are about to participate in a Virtual Field Trip where they will learn about how technology can be used in positive ways, especially when it comes to making observations of the world around us!

After the Virtual Field Trip

ACTIVITY 1

Explain to students that engineering and technology can be used to not only improve our lives, but the lives of animals as well! The survival of polar bears, an iconic arctic species, is threatened by rising global temperatures that affect their ability to find food and habitat. As sea ice melts and the polar bears' ability to hunt seals from ice floes diminishes, the bears look for new food sources. This can mean searching for food waste in garbage cans and puts the bears in danger as they wander into towns, getting closer to homes and people.

Tell students that for this activity, they will form teams of 2–3 who will work together to design and build a prototype 3-D model of a solution that can help polar bears!. Give each team a copy of the Polar Bear Solutions Activity Sheet and ask them to read the three solution pitches. They should choose one and work together to brainstorm, sketch, and build their model solution. Provide various craft and building materials for students to use to create their model.

Students can showcase their solutions for the class by giving a short, informal presentation or they can participate in a gallery walk by displaying their model and activity sheet for other teams to view as they rotate around the classroom. Students can give feedback on the solution creations as they view others' models.

Share your student's ideas and builds using this QR code to be featured in the LEGO gallery!

ACTIVITY 2

Ask students if they have ever heard of a *citizen scientist* before. If not, encourage students to make educated guesses about what the terms mean. Guide students in understanding that a citizen scientist is a regular person who helps professional scientists collect data and make observations about the world without formal training. Citizen scientists help actual scientists have eyes everywhere, so they can learn as much as possible about the world.

Pass out the *Citizen Scientist Search Activity Sheet* to pairs of students and review the directions provided. Then bring the pairs outside with the activity sheet, a writing utensil, and a clipboard in hand, so they can perform their research!

Once their research is complete, assemble the class back inside and review their findings:

- What is one interesting or surprising thing that the pairs observed?
- Based on their observations, what is one action students think their school community could take to better protect the environment?
- How could citizen scientists use technology, like smartphones, to capture even better observations? How may these observations lead to even better solutions?

Conclude by encouraging students to continue these observations of the world around them to help develop ideas and solutions that will help improve the planet. This activity gave them a starting point… Now can they think big and create something to help nature that people have never seen before?

ADD SOME TECH!

If your students have access to technology like smart phones, encourage half the pairs to record their observations using their devices. The class can then compare and contrast the observations recorded with tech versus those recorded with paper and pencil.

ACTIVITY 3

Kick-off with a quick discussion around the different types of technology that were presented during the Virtual Field Trip. How did each one help scientists learn about nature?

Tell the students that wildlife cameras are another technology that helps scientists learn more about animals. Unlike drones, wildlife cameras stay in one place. They record animals in their natural environment over a long period of time so scientists can learn how the animals act, what they eat, how they sleep, etc.

Challenge students to build their own camouflaged camera, specially designed for a habitat of their choice! Pass out one *Camouflage-A-Camera Activity Sheet* to each pair of students and review the directions together. Ensure students understand that their camera should be designed to blend into the animals' surroundings and function in the conditions of the ecosystem they selected.

Instruct students to work in pairs as they sketch ideas for their cameras and then use the creative materials to build models of their designs! When all models have been constructed, encourage pairs to share their models, explain the reasoning behind their design decisions, and compare or contrast their designs.

Conclude by summarizing that this activity gave students one suggestion of how they could apply what they learned during the Virtual Field Trip to help the natural world. Now it's up to them to keep thinking big, continue creating things that people have never seen before, and make a difference!

Polar Bear Solutions (page 1 of 2)

ACTIVITY SHEET

Instructions: With your team of 2 or 3, choose one of the following solutions ideas that will benefit polar bears. Use the brainstorming section to write down ideas, research Next, create a sketch of your solution. Finally, use the materials provided by your teacher to build a 3-D prototype model of your polar bear solution!

Choose one of the following projects and begin to design your solution!

1. Design a small, non-intrusive tracking device that can be attached to polar bears to monitor their movements and gather data on their behavior.
2. Design floating platforms that provide resting spots for polar bears in the water, helping them conserve energy during their journeys or create prototypes of artificial ice structures or platforms that can be deployed in the Arctic to mimic natural ice formations.
3. Create prototypes for waste disposal systems that are bear-proof and environmentally friendly. This helps prevent polar bears from scavenging in landfills, reducing the risk of human-bear conflicts.

RESEARCH/BRAINSTORMING

Do some research to determine why the idea behind this solution is so important for polar bear conservation. List ideas or create doodle sketches to conceptualize your solution.

PROTOTYPE SKETCH

Add labels to your sketch to help explain what each material represents in your solution.

SOLUTION AND INFORMATION

Give your solution a catchy name and write a short explanation of how your solution will work or be used to help polar bears.

Citizen Scientist Search

ACTIVITY SHEET

Directions: Citizen scientists help collect data around the world. Put on your own citizen scientist cap as you observe the world outside your school. Work with a partner to search for examples of the items below and fill each box with pictures and words to describe what you find!

Location: _____

Human action that positively affects the environment	Garden	A water source (as small as a puddle or as big as a lake)	Leaf smaller than your hand
Man-made structure	Bird	Animal	Human action that positively affects the environment
Flower	Human action that negatively affects the environment	Tree with smooth bark	Shape in the clouds
Human action that negatively affects the environment	Leaf bigger than your hand	What else do you see that is worth recording?	Bird sounds
Human action that positively affects the environment	Tree with rough bark	Sound made by nature	Human action that negatively affects the environment

Camouflage-A-Camera

Scientist Request: We learn best from cameras that can observe animals in their natural environment. However, for animals to eat, sleep, and play as they normally would, the camera must blend into its surroundings! The camera must also be able to function in the conditions of the animal's environment.

We are hoping to create cameras that could be used in the following locations:

- in a dark cave
- up in the jungle's canopy
- deep underwater
- inside a bird's nest
- in an underground tunnel or hole
- in the desert sands

Your Job: Design a camera for a specific environment. Select one location from the list above, then create a sketch of the camera in the space below. Label all important parts so the scientists can understand your design. Be sure to also fill out the "unique characteristics" callout.

Once your sketch is complete, create a model of your design in 3D!

Unique Characteristics: When we build this camera, what other features should we include? For instance, should it be waterproof? Glow in the dark?