

Sean Kenney's

BRICK PLANET

A magical journey made with LEGO® bricks

EDUCATOR GUIDE

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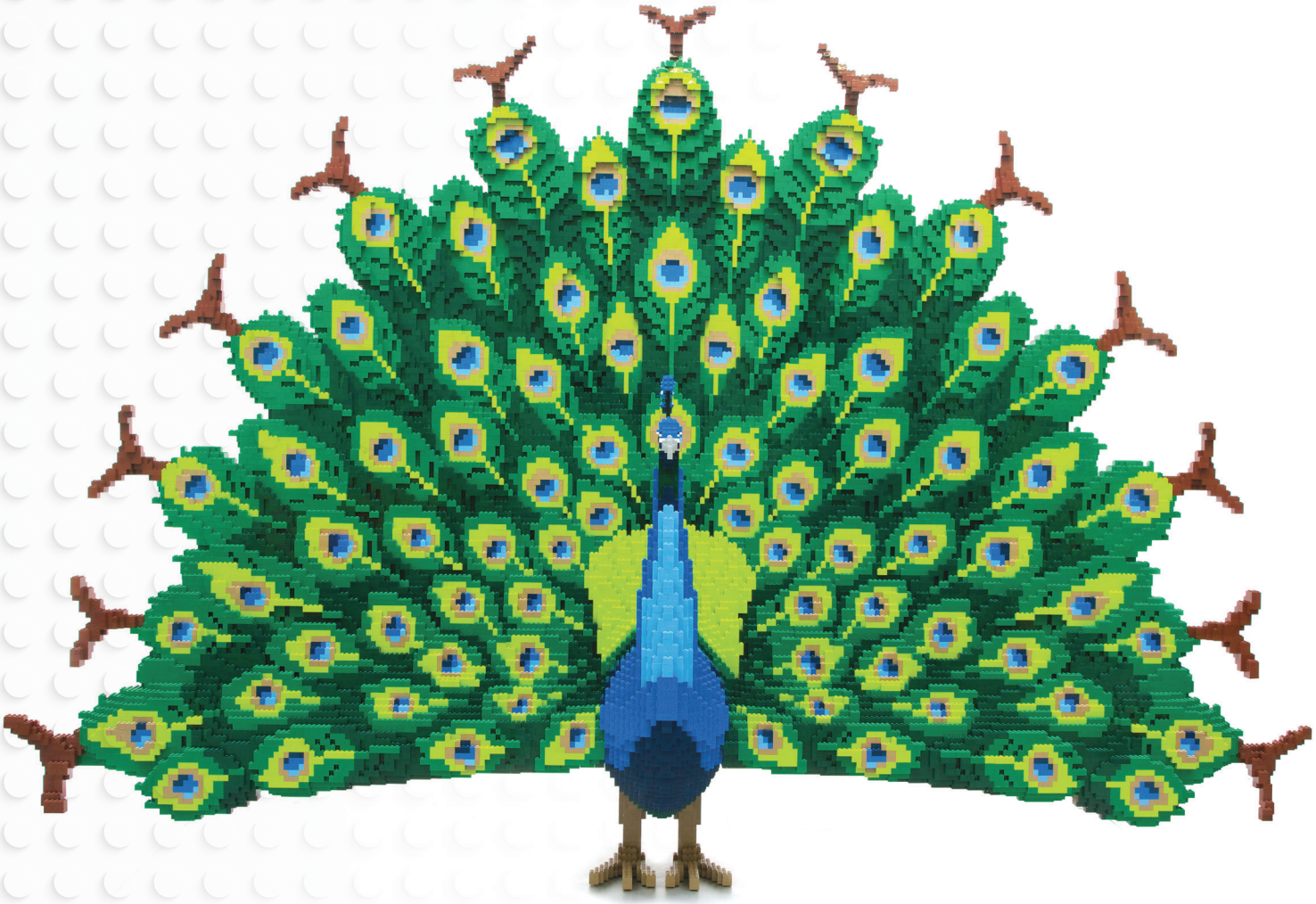
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INTRODUCTION TO THE EXHIBITION:

Welcome to *Brick Planet: A Magical Journey made with LEGO® bricks*, an immersive exhibition that blends the worlds of art and science to inspire curiosity, creativity, and a deeper appreciation for our planet. Through the visionary work of artist Sean Kenney, students will embark on a global adventure, exploring diverse ecosystems—from dense forests to icy Arctic landscapes—through awe-inspiring sculptures made with LEGO® bricks. This exhibition offers a unique opportunity for students to engage with scientific concepts, artistic expression, and the interconnectedness of the natural world.

Designed to spark wonder and discovery, *Brick Planet* invites learners of all ages to explore how art and science work together to help us understand the environment. Just as millions of LEGO bricks come together to form Sean Kenney's breathtaking sculptures, Earth's ecosystems are made up of intricate, interdependent systems that shape life on our planet. By analyzing real and replicated specimens, uncovering fascinating scientific facts, and creating their own LEGO-inspired designs, students will leave with a renewed sense of connection to nature—and an inspiration to protect it.



ABOUT THIS GUIDE

The guide is composed of ten activities that embody the ideals of STEAM and are aligned with the Next Generation Science Standards. These lessons and activities bridge the learning from the exhibition to the classroom.

OUR PLANET



ACTIVITY: DON'T YOU RUN OFF

Brick Planet showcases the amazing connection between life and environments. In this activity, students model how humans are impacting these ecosystems with runoff and pollution and highlight how we are harming many of the species and ecosystems in *Brick Planet*. Students brainstorm how to mitigate the effects of pollution on these ecosystems.

GRADE LEVEL:
3rd-5th

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

MATERIALS:
- o 2 sheets of plain scrap paper per student
- o Spray water bottle
- o Water based markers (blue, brown, red, and black)
- o Green permanent markers

DESCRIPTION:

- While in the *Brick Planet* exhibition, students try to identify the impacts and the relationship between humans, the animals, and the environment.
- After returning to school, ask students in what ways humans interact with animals and the environment. After students respond, ask what effect those practices have on animals. Discuss how humans are destroying animal habitats and polluting their drinking water.

- Tell students that they are going to model how humans impact animals' water supply. Have each student crumple up one piece of paper and then partially flatten it out on their desk. This paper will represent a map of a beautiful countryside.
- Using the blue marker, have students draw where they think the low points are. This is where -when it rains- the water will drain and rivers form.
- Have students trace the high points with the permanent black marker and have them use the green marker to draw trees and grass onto their countryside.
- Tell students they need to build farms for food. Students should draw a handful of farms on the map with the brown marker.
- Tell students that with all this industry they'll need a landfill, factories and houses. Draw in factories and landfills in red and houses in black.
- Ask the student to predict what's going to happen when it rains. Take the spray bottle and spray all the maps. Have students observe then draw an image of what they see.
- Discuss as a class what happened to the water supply. Why is it contaminated with other colors? Why didn't the green get into the water? How is this similar to the real world?
- Have students crumple a second piece of paper and flatten it back out. Tell them that they are going to get to redo this experiment but this time they need to try to keep all the pollution out of the water.
- Give students some additional tools like paper clips, clay or aluminum foil and have them discuss how to use these to reduce pollution in their watershed. Students should also focus on where they are putting the farms and factories.
- Spray the new maps with water and have students compare the results from the first maps. Discuss real world implications of this activity.



"Galapagos Tortoise"

POLAR BRRRICKS



ACTIVITY: BRRRRAVING THE BRRR

In the *Polar Brrricks Gallery*, students learn how the animals that live in the polar regions are dependent on environmental conditions and their physical features to keep their bodies warm. In this activity, students design and test a device that keeps water protected from both the heat and the cold to model how arctic animals are able to stay alive in frigid temperatures.

GRADE LEVEL:
3rd–5th

NGSS STANDARDS:
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

MATERIALS:
- o 16 ounce clear water bottle with label removed
- o Various art supplies (Styrofoam, colored paper, rubber bands, food coloring, cardboard boxes, etc.)
- o Thermometer

DESCRIPTION:

- After visiting the *Polar Brrricks Gallery* in the exhibition, discuss with students the various adaptations that animals have that help them survive.
- Discuss why maintaining body temperature is so important to the survival of all animals. Review with students the various strategies animals use to keep their internal temperature steady and survive even when faced with extremely hot or cold environments.

POLAR BRRRICKS

- Ask students to discuss ways that animals have adapted to stay warm in cold climates and cool in hot climates. Some of the main adaptations are fur, fat, and color.
- Tell students that they are going to be challenged with designing and constructing a polar bear's outer shell or coat that prevents changes in the animal's temperature. Their design needs to be able to hold a bottle of water which will represent the animal's body temperature. Each group will receive a bottle full of water and will test how their design helps the water resist temperature change.
- Talk to students about coolers, thermal mugs and other things that are commonly used to keep beverages warm or cold. Brainstorm ways students can construct their design to contain some of these features.
- Have groups discuss and sketch their design. Once you have seen their ideas, give groups their water bottle and other materials. Give students time to construct their design.
- After groups are done constructing, have them fill their water bottles and record the initial temperature of the water. Place each group's water bottle in a freezer and wait for an hour (at minimum). Remove the water bottle, take and record the temperature and have each group calculate the change to its initial temperature.
- Have students share their results and discuss why some models worked better than others. What were some of the common design features?
- Assuming it is hot enough outside, have students fill the water bottle with room temperature water and record its temperature. Groups then place their bottles in the sun for an hour and record the change in temperature to the water.
- Students should discuss how and why the models did better or worse in the cold as compared to the heat.
- Come back together as a class and discuss the results. Have groups talk about why they think some designs resisted cold better and why some resisted heat better. Ask students if they were to make another model, what improvements would they make. To conclude, ask students how their results are seen in nature. Are there any animals that have physical features that are reflected in their models?

POLAR BRRRICKS

ACTIVITY: POLE POSITION

In the *Polar Brrricks Gallery*, students learn about the similarities and differences of the Arctic and Antarctic. Both are at the Earth's poles and both experience extreme variations in temperature and daylight; however, they respond to and impact climate change in different ways. In this lesson, students conduct experiments to identify the rate ice melts on land versus in the ocean and compare the impact that melting sea and land ice have on sea level rise.

GRADE LEVEL:
Middle School

NGSS STANDARDS:
MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

MATERIALS:
- o 2 identical clear containers or trays
- o 2 identical ice cubes (or crushed ice of the same amount)
- o Stopwatch or timer
- o Thermometer
- o A flat surface to represent "land" (e.g., a small piece of plastic or rock)
- o Water (to fill the containers)
- o Ruler or measuring tape
- o Permanent marker (to mark water levels)

DESCRIPTION:

- In the *Polar Brrrick Gallery* of the exhibition, tell students to pay special attention to the extreme weather conditions at the North and South poles.
- Ask students to create a list of 3 to 5 ways conditions at the Arctic and Antarctica are similar and are different. Share ideas with the entire class. The main difference to highlight is that Antarctica is a landmass while the Arctic is all ice.
- Discuss with students how climate change is impacting both poles but they are responding differently. Have students discuss how and why they think the Arctic and Antarctica are reacting differently to global warming.
- Tell students that they are going to conduct 2 experiments. The first will measure the difference in ice melting rates on land versus in the sea and the second will identify how melting Arctic vs Antarctic ice affects sea level rise differently.

POLAR BRRRICKS

- **Ice melting rate:**
  - Discuss with students how to design an experiment to determine if ice melts faster on land or in water. Tell them the independent variable is ice on land or on water and the dependent variable is the amount of time it takes the ice to melt. Remind students that ALL other variables must stay constant.
  - Put students in groups and have them design their experiment. Below are sample directions for the experiment.
    - Label the two containers: Land and Water.
    - Land Container: Leave the bottom of one container dry to simulate ice sitting on land.
    - Water Container: Fill the other container with room-temperature water to a depth of about 2 inches to simulate ice sitting in the ocean.
    - Place an identical ice cube in each container. The ice in the Land Container should rest directly on the dry surface. The ice in the Water Container should be completely submerged or floating in the water.
    - Start the timer or stopwatch and begin observing the ice cubes.
    - Observe and record what happens to each ice cube over time. Note the size of the ice cubes at regular intervals (e.g., every 30 seconds or 1 minute).
    - Record the time it takes for each ice cube to melt completely and ask the following questions: "Which ice cube melted faster, and why?" "How does this relate to melting ice in real life?" and "What role does temperature play in the melting process?" Discuss with students why the ice in water melted faster.



"Mother Polar Bear and Cubs"

- **MELTING ICE AND SEA LEVEL RISE**
  - Label the two containers: Sea Ice and Land Ice.
  - Fill both containers with water until it reaches about halfway.
    - In the Sea Ice container, place ice cubes directly into the water to simulate floating sea ice.
    - In the Land Ice container, place the flat surface (representing land) partially submerged in the water. Place the ice cubes on top of the "land" above the water level.
    - Use a permanent marker to draw the initial water level on the side of each container. Record the starting water level.
    - Start the timer and observe how the ice melts in each container. While waiting, discuss with students: "What do you think will happen to the water levels as the ice melts?" and "How do sea ice and land ice melting affect sea levels in real life?"
    - Once the ice has completely melted in both containers, use a ruler to measure the water level in each container. Record the final water levels.
- After completing both experiments, ask students what they would change about the experiments to get more accurate results.
- As a class discuss: "What happened to the water level in the Sea Ice container? Why?" Explain that sea ice is already displacing water, so its melting does not significantly raise water levels and "How does this experiment relate to the melting of ice in polar regions?" Ask students to theorize if global warming will have larger impacts on the Arctic or Antarctic and what can be done to mitigate these impacts.

OCEAN ODYSSEY



ACTIVITY: KEYSTONE: WHAT HAPPENS WHEN THE OTTERS ARE OUTTA HERE?

In the *Ocean Odyssey* section of the exhibition, students observe the diversity of life in the oceans especially in areas near the coast like coral reefs and kelp forests. In this activity, students learn about the concepts of keystone species and participate in an activity that highlights their importance to an ocean ecosystem.

GRADE LEVEL:
3rd

NGSS STANDARDS:
3-LS4-4 Biological Evolution: Unity and Diversity Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

MATERIALS:
o Set of Jenga® Blocks
(the more sets the better)

DESCRIPTION:

- After visiting the *Brick Planet* exhibition, ask students to list what ecosystems they observed and what plants and animals lived in each. Record responses on board.
- Discuss with students the importance of biodiversity for the health of an ecosystem and ask students if all species within an ecosystem are of equal worth. Meaning- would the loss of one species over another have different impacts on the ecosystem?

OCEAN ODYSSEY

- Introducing the idea of Keystone Species. Tell them that these are species that have a disproportionately large impact on ecosystems and when they are removed, they can cause ecosystems to collapse.
- Tell students that they are going to investigate the Kelp forest and observe what happens when a keystone species is removed from that ecosystem.
- Ask students to name all the plants and animals found in Kelp forests and list them on the board. Examples are Sea Otters, Sea Urchins, Kelp, Algae, fish, and Sea Stars. Ask students which they think is the Keystone species.
- Pass out the Jenga blocks to students and ask each student to write the name of one of the plants or animals on it. Assign 3 students to write "Sea Otters" and the other plants and animals can be distributed evenly.
- Collect the blocks and build the Jenga tower. The blocks labeled "Sea Otter" should all go on the second row from the bottom. The rest can be randomly distributed.
- Have students take turns removing the blocks from the tower trying to not have it collapse. Tell every 5th student that they need to remove one of the Sea Otter blocks.
- When the third sea otter block is removed, the tower will fall. Discuss with students how this activity represented the impact of removing a keystone species from an ecosystem.
- Project images on the board of the impact hunting beavers had on kelp forests along the west coast and discuss with students. Show students how removing the Sea Otters caused the Sea Urchin's (Sea Otter's favorite food) population to boom. These Sea Urchins then ate all the kelp which provided food and shelter for other animals which led to these forests becoming "urchin barrens" where little to no life can survive.
- Discuss with students other keystone species, like the gray wolves in Yellowstone or the African Elephant on the Savanna, and their role in their ecosystems.
- Revisit the Jenga activity and have students build a new tower. Challenge students to arrange the bricks of the tower in a way that both represents these ecosystems and supports their health and longevity.

ACTIVITY: ONE CONNECTED OCEAN

In the *Ocean Odyssey* section of the exhibition, students learn how even though our textbooks list five distinct oceans, they are all connected through underwater currents that move heat, nutrients, plants and animals across the globe. In this activity, students observe how the interaction of cold freshwater and warm saltwater drives ocean circulation and influences global climates.

GRADE LEVEL:
Middle School

NGSS STANDARDS:
MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climate

MATERIALS:
- o One clear food storage container (about the size of a shoebox) - one per group
- o Printout of a world map
- o Tape
- o Aluminum foil
- o Blue and red food coloring
- o Salt
- o Pencil

DESCRIPTION:

- Ask students to reflect on the *Ocean Odyssey* exhibit and ask how Earth's oceans are similar and different. Discuss what are the environmental factors that have an impact on the ocean?
- Ask students to brainstorm and share their ideas on what causes ocean currents. Show students an image of the ocean conveyor belt and ask them to make observations on what they see.
- Pass out the world map printout and ask students what they know about the temperatures in Europe and on the east coast of the United States. Have students notice how much farther north Western Europe is than the East Coast of the United States.
- Have students draw a line of latitude from some of the major cities of Europe and note how even though cities like Paris are farther north than Montreal, or London is farther north than Calgary, the European cities have much warmer climates. This is due in part to the great ocean conveyor belt. Warm waters move north from the equator to Europe. These warm currents bring warm weather to Western Europe with them.
- Tell students that they are going to model the mechanism that drives the ocean conveyor belt. Put students in groups and pass out the materials. Have students tape the aluminum foil in the middle of the food container dividing it into two equal parts. The aluminum should be taped in well enough to not let water pass through it.

- Fill each side of the container with water. Fill one side with warm water and one side with cold water. Fill both sides at the same time so the aluminum "wall" doesn't break.
- Add red food coloring to the warm side and blue food coloring to the cold side and add 3 tablespoons of salt to the cold side and stir.
- Tell students that they are going to carefully poke a hole in the top and bottom of the aluminum wall but before they do, ask for students to predict what will happen.
- Poke a hole with a pencil in the top and bottom of the aluminum foil and have students observe what happens. You might sprinkle some pepper on the surface to help students be better able to see what's happening. Continue to observe until there is no more movement in the water. The container should have a layer of red water on top of a layer of blue water.
- Ask students to describe what they saw and to brainstorm explanations of how and why this is happening. Tell students that this movement is caused by the difference in the density of the warm fresh water and the cold saltwater.
- Show students an image of the great ocean conveyor belt again and ask students to describe how the model they made represents what is happening in the North Atlantic. Explain to students that as water moves north the Atlantic, water evaporates causing the salinity of the water to increase. This same water gets much colder as it gets near Greenland. Since the water has become both cold and very salty it becomes more dense and sinks. This sinking is one of the mechanisms that drives ocean circulation.
- Ask students what impact global warming will have on the circulation of water in the Atlantic. Discuss with students how increasing global temperatures will weaken the conveyor belt, primarily by causing the land-bound glaciers of the North Atlantic to melt. This melting will add tons of freshwater to the ocean's surface, making the water less saline. As a result, the change in density will be less severe, and the water will not sink at the same rate.
- Ask students how global warming could lead to colder temperatures in Western Europe. Discuss how the weakening of the conveyor belt will slow the flow of warm water, which brings warm air and weather to the region. This explains how a warming Earth can cause some areas to experience colder conditions.



"Hatching Baby Sea Turtle"

SAVANNAH CROSSING



ACTIVITY: BLIND SKETCH

In the *Savannah Crossing* section of the exhibition, students learn about the importance of field journals in science. They learn that these journals are not just for taking notes but are important tools in capturing data about plants, animals and environments. In this activity, students learn some basic techniques they can use to collect field notes.

GRADE LEVEL:
3rd-5th

NGSS STANDARDS:
3-5-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

MATERIALS:
o Students journals

o Various images of animals

DESCRIPTION:

- In class, discuss the "safari art journal" students created while visiting *Brick Planet*. Ask students what the purpose of these journals is.
- Discuss how journals not only capture your thoughts and opinions but they are also a tool to collect data in the field. That data can be quantitative but can also be qualitative like a sketch.
- Tell students that they are going to learn 3 techniques that will help them collect more accurate data. Tell students that even though our understanding of science is evolving, the data never changes and that even field notes that were taken 200 years ago are valuable because even though our understanding of the data has changed, the data has not. Therefore, scientists today can use and learn from the journals of scientists who lived hundreds of years ago.

SAVANNAH CROSSING

Activity #1: Blind Sketch

- Put students in pairs and tell them they are going to sketch each other. There are only two rules:

  1) don't look down at your paper

  2) don't lift your pencil off the page until you are finished

- Give students 4 minutes to sketch each other without looking at their paper.
- This will be hard! Students will probably laugh a lot when they see what they drew. It's a great exercise for drawing what you actually see, as opposed to what you think is there.
- You can repeat this activity by having students sketch images of animals or any specimens you have.

Activity #2: Blurred Lines

- Tell students that sketching an object or organism becomes easier if you break it into basic shapes, like ovals, rectangles, and triangles.
- Project an image of an animal on the board. Encourage students to look at the object, and then blur their vision so that the basic shapes emerge. Students shouldn't focus on details or contours for this exercise, just shapes.
- Give students 1 minute to sketch the basic shapes of the animal projected on the board.
- Have students share their drawings and discuss the shapes they saw.

Activity #3: Time flies!

- Discuss with students the challenge of sketching animals in nature. Sketching quickly can be liberating; there's less time to worry about making a pretty picture. When scientists are studying animals in nature, they often have only a few seconds to glimpse an animal before it bounds away. So, they have to learn how to make quick observations and then sketch from memory.
- Project an image of an animal for 15 seconds and then give students 5 minutes to sketch the animal, from memory, in as much detail as possible.
- Have students share their drawings and discuss which of the techniques from Activities 1 and 2 were most helpful with this sketch.
- Project 2 more images for 15 seconds and give students time to sketch from memory. Debrief with the class about techniques that were and were not helpful.

SAVANNAH CROSSING

ACTIVITY: TO MIGRATE OR NOT TO MIGRATE

In the *Savannah Crossing* section of the exhibition, students learn about migration and why some animals migrate over huge distances every year while others stay in one place. In this activity, students compare and contrast the different strategies animals have for survival.

GRADE LEVEL:
Middle School

NGSS STANDARDS:
MS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MATERIALS:
- **o Graph paper**
- **o Open space (classroom, gym, or outdoor area)**
- **o Obstacle markers (e.g., cones, chairs, or tape to create hazards like rivers, predators, or cities)**
- **o Animal cards or tokens (representing migrating animals like birds, butterflies, or whales)**
- **o Food tokens (beans, paper cutouts, or small objects)**
- **o A list of environmental challenges (written on cards or called out by the teacher)**

DESCRIPTION:

- After returning to school from the exhibition, ask students: "Have you ever wondered why birds fly south for the winter or why some whales swim thousands of miles each year? What makes them go through such a long journey?"
- Briefly introduce the concept of migration: Migration is the seasonal movement of animals from one place to another, often in search of food, better climate, or a safe place to reproduce.
- Share examples of migrating animals (e.g., monarch butterflies, Arctic terns, humpback whales) and non-migrating animals (e.g., squirrels, raccoons, mountain lions).
- Ask students, "What do you think are the main reasons animals migrate?" and write their answers on the board.
  - Food - Example: Wildebeest migrate in Africa to find fresh grass.
  - Weather/Climate - Example: Arctic terns migrate to avoid extreme cold.
  - Reproduction - Example: Sea turtles travel to beaches to lay eggs.
  - Survival - Example: Salmon migrate to rivers where they were born to spawn.

SAVANNAH CROSSING

- Have students create a Venn diagram by drawing 2 overlapping circles. Label one circle "characteristics of migrating animals" and the other "characteristics of non-migrating animals". The middle is for similarities.
- As a class, brainstorm examples and characteristics to fill in the diagram.
  - Migrating Animals: Move long distances, adapt to multiple habitats, influenced by seasonal patterns.
  - Non-Migrating Animals: Stay in one place, adapt to local conditions, stockpile food.
  - Similarities: Both need food, shelter, and protection; both face predators and challenges.
- Have students add in animals they know into the migrating or non-migrating animals. For example:
  - Migrators: Monarch butterflies, Arctic terns, gray whales, wildebeest.
  - Non-Migrators: Squirrels, bears (hibernate instead), rabbits, foxes.
- Ask students: "What do you think makes migration difficult for animals?" List responses:
  - Long distances
  - Predators during travel
  - Loss of habitat or food sources along the route
  - Climate change affecting migration patterns
- Ask students why some animals migrate while others do not. Ask students to discuss the pros and cons of both methods of survival.
- Tell students they are going to observe the challenges animals face during migration by participating in a simulation that mimics the journey of a migrating species.



"Wildebeest and Zebra"

Sean Kenney.com

SAVANNAH CROSSING

- How to Set Up the Migration Path
  - Create a "migration course" with different stations representing challenges animals face. For example:
    - Start: Winter habitat (e.g., a forest or tropical area).
    - Obstacle 1: River crossing (students must hop across marked areas).
    - Obstacle 2: Predator zone (students must avoid being tagged by classmates acting as predators).
    - Obstacle 3: Urban development (students navigate through a "maze" of cones or chairs).
    - Finish: Summer habitat with food tokens.
- Assign Animal Roles: Split students into groups or assign individual roles (e.g., Arctic terns, monarch butterflies, or wildebeests) and explain what their animal needs during migration:
  - Food tokens represent energy.
  - Safe passage - avoid obstacles like predators or human interference.
- Run the Migration Simulation
  - Students "migrate" through the course. They:
    - Collect food tokens at specific stations to stay "alive."
    - Face challenges at each obstacle:
      - Rivers: Jump between safe spots (taped areas) to avoid "drowning."
      - Predators: Avoid being tagged; if tagged, they lose a food token.
      - Urban development: Crawl under or navigate through a maze without touching barriers.
    - Reach the final destination with at least one food token to survive the migration.
- As a class, discuss the following questions:
  - "What challenges did you face during migration?"
  - "How does this compare to what real animals experience?"
  - "What might happen if food sources or habitats disappear along the route?"
- Discuss human impact on migration and brainstorm ways to help, like conserving habitats and reducing pollution.

WALK IN THE WOODS



ACTIVITY: LIFE BALANCE

In the *Walk in the Woods* section of *Brick Planet*, students learn about the interdependence of the living and nonliving parts of the forest ecosystem. In this activity, students play a game to observe how predators and prey stay in balance to maintain the health of ecosystems.

GRADE LEVEL:
3rd

NGSS STANDARDS:
3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

MATERIALS:
o Graph paper

DESCRIPTION:

- When visiting the *Walk in the Woods* exhibit, ask students to pay special attention to the various ecosystems that are on display. Tell students to not just focus on the animals, but on everything in the exhibit and to think about how they are all interconnected.
- Discuss with students what an ecosystem is and what it means to have a balanced ecosystem.
- Have students pay special attention to what eats what and discuss the interdependence of predators and prey.
- After returning to school, ask students to share what they know about ecosystems and balanced ecosystems. Write responses on the board.

WALK IN THE WOODS

- Ask students what the terms predator and prey mean and ask for some examples. Ask students how or if the population of these animals are connected.
- Tell students they are going outside to simulate what it's like for different animals to survive in the wild.
- Count students off from 1 to 4. Separate the ones from the twos, threes and fours. Have students line up so the ones are facing the twos, threes and fours about 20 yards apart. Tell the ones that they are the wolves or the predators and the twos, threes and fours are the deer or the prey.
- On a large poster, record the number of prey and predators.
- Tell students that the goal of the game is for the deer to run from one side of the field to the other without getting tagged by the wolves. The goal for the wolves is to tag as many deer as they can.
- Tell students to be careful as they run, then tell the deer to try to run to the other side of the field without getting tagged by one of the wolves.
- If a deer is tagged, it means it has been eaten. The student who was tagged becomes a wolf for the next round. If a wolf does not tag a deer, it dies and becomes a deer in the next round.
- Repeat this process for 5 or 6 rounds, being sure to record the population of the deer and wolves on the poster each round.
- Go back to the classroom and have students graph the data.
- Discuss the trends and ask students why the populations of both deer and wolves were always going up and down. Note that if the deer population got too high then more wolves would survive and bring the deer population back down. Talk to students about how this is an example of a balanced ecosystem where one species needs to stay in balance with another for its own survival.
- Discuss with students how this balance of predators and prey was important to both the survival of ecosystems and to the survival of animals today.



"Doe and Fawn"

CONNECT IN THE CITY



ACTIVITY: URBAN BIODIVERSE SCHOOLS

In the *Connect in the City* section of the exhibition, students learn about ways to foster nature in urban spaces. In this activity, students brainstorm ways in which they can increase the biodiversity of their schoolyard and will create a model to share their ideas with the rest of the school.

GRADE LEVEL:
Middle School

NGSS STANDARDS:
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MATERIALS:
- **Art supplies (paper, glue, markers, toilet paper rolls, pipe cleaners, etc.)**
- **Computer (optional)**

DESCRIPTION:

- While in the exhibition, students try to identify the various ecosystems on display. Have them pay special attention to the connection between the plants, animals, and their environment.
- Ask students to brainstorm things that make an ecosystem thrive. Be sure to discuss the role of both biotic and abiotic factors and the importance of biodiversity on the health of an ecosystem.
- Ask students to share things that they like about nature and being outside. What are the things that they enjoy?

CONNECT IN THE CITY

- Tell students that often people are concerned about the negative impacts humans have on the environment but that humans are a part of the ecosystem. We can take steps to support the ecosystem while also cultivating a space that will be more enjoyable for us.
- Put students in groups and have them draw a floor plan of the schoolyard. It can be of one specific area or of the entire yard. Tell students they are going to modify the space so that it both increases the diversity of life there and makes the space more enjoyable for students.
- Each group needs to come up with at least 5 new features that will both increase biodiversity and make the space more fun for students. An idea to share with students to get them thinking could be planting a garden. This increases the types of plants and attracts pollinators while also providing yummy food for students. Adding in bird feeders will attract more types of birds and also allow students to enjoy watching the birds eat. Students can be as creative as they want, but each group needs to come up with at least 5 ideas and explain how they are both increasing biodiversity and student's quality of life.
- Once groups have come up with their 5 ideas, have them make a model of their schoolyard redesign using the art supplies.
- Have each group present their models to the class and as a class, pick a handful of ideas that are plausible and implement them at your school.



"Eiffel Tower"

OUR OWN BACKYARDS



ACTIVITY: BACKYARD BIODIVERSITY

In the *Our Own Backyard* section exhibition, students learn about the importance of biodiversity in maintaining healthy ecosystems and how we can support biodiversity in our gardens. Students observe the biodiversity at various places in the *Brick Planet* exhibition, and measure biodiversity at various places around their school. Students develop plans for increasing their schoolyard's biodiversity.

GRADE LEVEL:
Middle School

NGSS STANDARDS:
MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MATERIALS:
o Paper

o Hula hoop or string

DESCRIPTION:

- While visiting *Brick Planet*, discuss what an ecosystem is, what the parts of an ecosystem are, and what biodiversity is. Discuss how an ecosystem is defined by not just its living (biotic) but its non-living parts (abiotic).
- Tell students that in general the more biodiverse an ecosystem is, the more stable and healthy it is.
- Tell students that they are going to record the biodiversity of several locations around the exhibition and compare results.

OUR OWN BACKYARDS

- Put students in groups and have them identify different environments in the exhibition. For example, they should record all of the biotic and abiotic features in the forest ecosystem in the *Walk in the Woods* exhibit.
- On a sheet of paper, students name their environments and create a table with one column labeled biotic and the other abiotic.
- When back at school, students tally up the amount of biotic and abiotic things in each environment, share their results and discuss.
- Tell students that they are now going to record the biodiversity of their schoolyard. Go outside and have each group place a hula hoop (or a string tied in a circle of similar size to a hula hoop) in different places. Take 5 minutes to record all of the biotic (grass, weeds, rollie pollies) and abiotic (rocks, concrete, glass) things in the circle. Be sure to spend a full 5 minutes as students will learn that there are many more things there than you see at first look.
- Ask if they were surprised by any of the results or that some environments had so much more or less biodiversity in their environment. Ask students to look for trends—what are the connections between biotic and abiotic features in their environment? Is there generally more of one than the other? Or does more abiotic features mean there are more biotic organisms?
- Have groups design their own environment that they think would help support the most diversity of life. Have students draw out their ideas and explain their rationale as to why they created the environment they did. Challenge students to make this new environment a space that can also be enjoyed by the students at the school.
- Have students create this environment somewhere on the schoolyard. Everyday for 2 weeks, have students observe their environments and count the biotic and abiotic features in it.
- After 2 weeks, discuss the results as a class. Why were some environments more able to support biodiversity? What implications does this have in the real world?


"Ladybug"