Learning Activity:

**Biodiversity Escape Room**

<table>
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<tr>
<th>Activity Type:</th>
<th>Team Building and Puzzle-Solving</th>
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<tr>
<td>Focus Area:</td>
<td>Science, Social and Emotional Learning (Relationship Skills)</td>
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<tr>
<td>Time Required:</td>
<td>60 minutes</td>
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**Overview**

In celebration of the new chapter in DreamWorks Animation’s beloved action-comedy franchise *Kung Fu Panda*, World Wildlife Fund and DreamWorks Animation have teamed up to raise awareness about the plight of the real wildlife depicted in the film. *Kung Fu Panda 4* tells the story of Po, the giant panda who is the Dragon Warrior and is tapped to become the Spiritual Leader of the Valley of Peace. Just like Po takes on the role of Spiritual Leader, real-life animals, such as giant pandas and snow leopards, contribute to the health of their natural ecosystems. In fact, all organisms play a valuable role in keeping their native ecosystems balanced and thriving. When we protect one species, we’re helping to protect all of them for the benefit of people and nature.

In this activity, learners will participate in a team-building exercise to learn about the various roles of species that contribute to the health of an ecosystem. With teammates, students will be tasked with solving a sequence of escape room–style puzzles related to biodiversity and relationships between living things. After being introduced to the concept of interdependence, learners will demonstrate how we all rely on the efforts of others to reach a common goal. They can then apply this concept to the roles of the characters in *Kung Fu Panda 4* and consider how each contributes to a positive, successful outcome to the story.

**Objectives**

After completing this activity, students will be able to

- provide examples of ecological roles within an ecosystem
- define biodiversity and explain its connection to ecosystem health
- recognize their own individual contributions to a team effort
Materials Needed

- Writing utensils
- Internet access and projector to show the video clip What is Biodiversity?
- Copies of the student handout (included), one per student
- Copies of challenge instructions (included), at least one per group
- Answer key (included)

Vocabulary

**Biodiversity**: all the different kinds of life found in one area, including animals, plants, fungi, and bacteria

**Ecosystem**: the living (e.g., humans, wildlife, plants) and nonliving (e.g., air, water, soil) components in an area that interact with each other in an interconnected way

**Ecosystem engineer**: a species that plays an important role in physically creating, changing, or maintaining its habitat, benefiting other species that live there

**Habitat**: an environment in which plants and animals live, breed, and get food, water, and shelter

**Interdependence**: the reliance that all living things have on each other to survive

**Keystone species**: a species of plant or animal that produces a major impact on its ecosystem and is considered essential to maintaining optimum ecosystem function or structure

**Mutualism**: a relationship between different kinds of organisms that benefits all

**Pollination**: the transfer of pollen from male plant parts to female plant parts, resulting in fertilization, fruits, and seeds

**Predator**: an animal that obtains food mostly by killing and eating other animals

**Prey**: an animal eaten by a predator as food
Activity Procedure

Teacher Preparation

- This group activity will be most effective with a total group size of at least 12–15 individuals, broken into teams of no more than 4. Depending on class size, divide students into small teams, preferably of equal number. They should be assigned at random; if desired, use a creative method of organizing teams, such as having students select a number or color as they enter the learning space.

- In advance of the activity, determine areas of the learning space where the teams will work. This could be at tables with chairs, or in corners of the room with enough space for groups to assemble.

- This activity consists of a series of puzzle challenges that teams must complete sequentially. Like an escape room, a team cannot advance to the next challenge before correctly solving the current challenge. Once a team feels they have solved the puzzle, a team representative must bring their answer to you, as facilitator, to confirm that it was answered correctly. If so, then provide the team representative with the next puzzle challenge. Determine a central location between the designated team spaces for you to review answers and distribute challenges.

- Depending on the size of the teams, it may be helpful to have several copies of each challenge per team to share. After completing five team puzzle challenges, participants will answer the questions on the student handout. It is recommended that you provide one copy of the handout per individual to assess each learner's understanding, but you can opt to have teams continue working together to complete it.

Part 1: Engage

- Once participants are in random teams, have each team gather in one of the designated team areas of the learning space (as referenced above).

- Inform students that the groups they're in will be their teams for the activity and that, before beginning, they must decide on a team name, based on what they all have in common (for example, if team members discover that they all like peanut butter, then they could be Team Peanut Butter). The point of this "common thread" warm-up exercise is to encourage camaraderie among the teammates. Allow several minutes for groups to discuss and agree on a team name.

- To introduce learners to the topic, show the short video What is Biodiversity?

- Ask viewers this question: Based on what you learned in the video, what does an ecosystem need to be healthy? Hold a discussion around the importance of biodiversity to ecosystem health, using the definitions provided.

If an area has a lot of biodiversity, then it's a sign that the environment is healthy and the ecosystem is thriving. But biodiversity involves more than just having many different plants and animals; while that's important, it's also important that these populations are well-balanced and working together for the ecosystem to thrive as a whole.
• Challenge learners to think about the types of relationships that exist within an ecosystem. As a class, discuss the kinds of roles plants and animals have that may help provide for other species. Call for volunteers to share examples, using species that they are familiar with.

*One example of a species that does a lot for other species is tigers. Tigers are important members of their ecosystem because they are predators. Their predation helps keep smaller animals, such as boars and deer, from becoming overpopulated, which ensures that there is plenty of food and water for all the living things within that ecosystem. Without tigers, the ecosystem would crumble.*

• Introduce the concept of interdependence, referencing some of the examples that students may have provided. So that those animals can fulfill their roles, what else do they need?

*For example, tigers rely on the smaller animals (e.g., boars, deer) for prey, and those smaller animals rely on plants to eat. This is an example of interdependence, showing how all living things depend on each other to survive. To ensure a healthy population of tigers, there must be a healthy population of their prey and of the prey's food source.*

• Connect learners to the concept of interdependence by asking them to consider examples within their own lives. For instance, your dog may depend on you to provide it with food and exercise; who or what do you depend on to be healthy and survive?

**Part 2: Explore**

• Now that learners have been introduced to biodiversity and interdependence, review the objectives and rules of the escape room activity. As a team, they must work together to solve a series of puzzle challenges about ecosystem roles and how species in those roles contribute to healthy biodiversity. (A few of the puzzles feature species found in Asia, where the *Kung Fu Panda* films take place). Teams must submit each puzzle's answer for approval before receiving the next challenge. There are five team puzzle challenges. A student handout must also be completed after finishing the challenges.

• Just like species support each other within an ecosystem, students will need to work together to complete each challenge. Have teams take a few minutes to strategize and determine what each team member’s role will be in the escape room. For example, one teammate could be the puzzle reader, one could be the recorder of the answer, and one could be the runner who submits the answer.

• When the activity starts, ask one person from each team to come up to receive challenge #1. Have the handouts for the other challenges ready as well.
• To add a competitive element, display a chart (like the one below) to track each team's progress. Check off each challenge as a team completes it.

<table>
<thead>
<tr>
<th>Team</th>
<th>Challenge 1</th>
<th>Challenge 2</th>
<th>Challenge 3</th>
<th>Challenge 4</th>
<th>Challenge 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex: Team Peanut</td>
<td>X</td>
<td>X</td>
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At the completion of the activity, learners should be able to answer the key question:

**Key Question:** What kinds of roles do animals have within their ecosystem that help other species survive and contribute to a thriving, biodiverse ecosystem?

**Part 3: Explain**

• Once teams complete the five puzzle challenges, distribute copies of the student handout. Students can work with their team members to answer the questions that assess their understanding of biodiversity, ecosystem roles, and interdependent relationships.

• At the bottom of the handout, learners will see a bonus question asking them to come up with another example of interdependence that exists between species not included in the activity. On the back of the paper, students should write a few sentences that describe how the animals they selected depend on and help one another.

**Part 4: Elaborate**

• Now that students have had a chance to consider the various types of interdependent relationships that exist in nature, begin a wrap-up discussion about how different an ecosystem would be without all the species fulfilling these roles and contributing to biodiversity.

• When reflecting on what they learned during the activity about the importance of these roles, ask learners these questions: What causes an ecosystem to lose biodiversity, and what are the effects? What would happen if a species with one of those roles disappeared? Call for volunteers to share examples of the chain reactions that would occur with the loss of one of those animals. Refer to the gray wolf example in the keystone species challenge.

*Human activities such as habitat destruction and pollution are causing species to become threatened or extinct and ecosystems around the world to lose biodiversity. When one species is affected, it can cause a ripple effect involving many other species around them (because species are often interdependent on each other), and eventually lead to the decline of the health of the entire ecosystem.*
Part 5: Evaluate

- How can we work together to help prevent biodiversity loss? As a follow-up assignment, have students come up with one example of a group effort that could be a way to conserve nature and protect biodiversity. Remind them to reflect on the escape room activity and how it was beneficial to work together as a team. If they are familiar with the film, have them recall the various skills and strengths of the Kung Fu Panda 4 characters and how each contributes to the completion of the story's mission.

- Once assignments are collected and reviewed, pose a long-term challenge for learners to come up with a comprehensive strategy to implement their plan to conserve biodiversity, including how they will rally others to put their ideas into practice. Monitor students’ progress on their plans throughout the assignment’s term and provide guidance and support, as needed.

Extended Learning Opportunities

- If learners are familiar with the film, have them provide an example of interdependence among the characters in Kung Fu Panda 4. What characteristics, abilities, skills, or strengths does each character have that is helpful to others? How do the characters rely on each other? Like the discussion around the effects when an ecosystem loses one of its important members, consider what would happen if one of the main Kung Fu Panda 4 characters were missing—how would that affect the outcome or the ending of the movie?

- Have learners perform research on the various animals that were the answers to the five challenges (i.e., river dolphin, Asian elephant, rhino, oxpecker, snow leopard, and hummingbird) and have them explain why that animal is identified as having that specific role.

- As a self-reflection piece, ask students to consider their role in the team’s effort. Have them answer these questions: What was your role in this team activity? How did your team depend on you to make the team strong and successful, like an ecosystem?

Additional Resources

Game: A Tiger’s Tale Trivia Game
Lesson: Biodiversity Mosaic
Activity book: Grasslands and Pollinators
App: Seek by iNaturalist
Video series: Our Planet
Webpage: What is Biodiversity?
**Answer Key to Challenges**

1. **Keystone species** = river dolphin

2. **Ecosystem engineer** = Asian elephant

3. **Mutualist** = rhino and oxpecker (242)
   (For reference, other matched pairs are: shark and remora, woolly bat and pitcher plant, goby and pistol shrimp, clownfish and sea anemone, ant and aphid)

4. **Predator** = snow leopard

5. **Pollinator** = hummingbird

**Answer Key to Student Handout Challenge**

**Keystone species:** krill

**Ecosystem engineer:** parrotfish

**Mutualist:** coral and algae

**Predator:** polar bears

**Pollinator:** ladybugs

**Seed-dispersing animal:** chimpanzees
Biodiversity Escape Room:

Challenge #1 = KEYSTONE SPECIES

Read:

A keystone species is any species of plant or animal that has a major impact on its ecosystem and is considered necessary in keeping an ecosystem functioning. The disappearance of a keystone species could cause significant changes to its ecosystem. A healthy population of keystone species = a healthy ecosystem.

One example of a keystone species is the gray wolf. Back in the 1900s, gray wolves were heavily hunted in Yellowstone National Park. This led to their disappearance from the area. Without the wolves, there were too many herbivores such as deer and elk (which were typically eaten by the wolves), which led to many problems. The overpopulated herbivores caused less food and water to be available to other animals. They ate trees near the riverbanks, causing birds to lose their homes and the water to flow faster without tree roots slowing it down. With so many of them spending time by the rivers, these herbivores also caused the riverbanks to erode and make the water dirty and cloudy, which made it harder for aquatic plants to collect sunlight (which then affected the aquatic animals that depend on those plants to survive). Without the wolves, the whole ecosystem spiraled downwards. In the 1990s, wolves were reintroduced into the park and the Yellowstone ecosystem is once again balanced.

Challenge:

Use the clues in the poem and the numbers in the answer code to identify the keystone species being described. The first letter is provided to help get you started.

In rivers deep, a mystery lies,
A creature ancient, oh how wise
With playful leaps and gentle spin
Its presence tells a tale within

A keystone species, it holds the key
To a thriving Ganges, wild and free.
Its health reflects the waters wide,
In its dance, a secret hides

In currents strong, it takes its part,
A guardian of the river's heart.
Guess this friend, so pure and bright.
Whose presence keeps the balance right?

ANSWER:

R ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
Biodiversity Escape Room:

Challenge #2 = ECOSYSTEM ENGINEER

Read:

An *ecosystem engineer* is a species that plays an important role in physically creating, changing, or maintaining its habitat, benefiting the other species that live there. Some ecosystem engineers may also be considered a keystone species.

One example of an ecosystem engineer found in North America is the prairie dog. Prairie dogs live in the grasslands of the Northern Great Plains. They create underground burrows to use as shelter for themselves and their pups. As they dig their burrows, they loosen up the soil, allowing water and nutrients to filter in and help plants grow. These burrows also provide habitats for other animals, including black-footed ferrets and burrowing owls.

Challenge:

Complete the word search by finding the names of the species listed in the word bank. Then use the leftover letters in the puzzle to spell out the name of an important ecosystem engineer. The words may be vertical, horizontal, or diagonal.

WORD BANK:

- Pangolin
- Orangutan
- Ox
- Leopard
- Panda
- Otter
- Camel
- Tiger
- Sturgeon
- Gibbon
- Saola
- Frog
- Eel

ANSWER: ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
Biodiversity Escape Room:

Challenge #3 = MUTUALIST

Read:

*Mutualism* is a special type of relationship that species can have between each other in which both species benefit. Each mutualist species does something to help the other, and, in some cases, they may not be able to survive without each other. Some mutualist species are also keystone species.

One example of a mutualistic relationship is that of sharks and remora fish. Remoras are often seen attached to a shark's underbelly. While there, they feed on scraps left behind from the shark's meal or on any parasites living on the shark. In this relationship, the remora gets an easy meal and protection from predators by being attached to the shark (not to mention a free ride around the ocean). The shark gets a nice cleaning from the remora, as some of the parasites removed from its skin are often harmful. Both remora and shark benefit from this relationship.

Challenge:

Each of the species below is in a mutualistic relationship with one of the other species. Use the clues that indicate what each species gets out of the relationship to correctly match each pair (shark and remora are already included for you). Once you've matched the pairs, add their two numbers together. Only one of the pairs contains an animal that is also an important *ecosystem engineer*, *keystone species*, AND is currently critically endangered. Correctly identify that pair and submit that total to advance to the next round.

**Remora**
- gets food and protection
  - 62

**Rhino**
- gets cleaned of parasites
  - 97

**Woolly bat**
- gets a resting place
  - 29

**Goby**
- gets a burrow to live in that its partner built
  - 78

**Oxpecker**
- gets food off its partner's back
  - 145

**Ant**
- gets nutrition from honeydew that its partner makes after eating plant sap
  - 139

**Pitcher plant**
- gets nutrients from its partner's poop
  - 198

**Shark**
- gets cleaned of parasites
  - 170

**Pistol shrimp**
- gets protection from predators (it can't see well enough to know when they're coming)
  - 84

**Sea anemone**
- gets food from its partner's waste and protection from predators
  - 111

**Aphid**
- gets protection from predators and parasites
  - 53

**Clownfish**
- gets protection and shelter
  - 206

**Answer:** ___________ (sum of the two species)
Biodiversity Escape Room:

Challenge #4 = PREDATOR

Read:

*Predators* are animals that hunt and feed on other animals. The animals they eat are their prey. Some predators are also considered a keystone species.

Predators are important members of their ecosystem because their hunting helps to keep populations of other animals balanced. If predators were to be removed from the environment, then other animals would become overpopulated and the ecosystem would not be able to provide enough food and water for all, eventually leading to its collapse. Examples of top predators are tigers, sharks, and crocodiles.

Challenge:

Use the key to decode the name of an important predator.

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**ANSWER:**

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Biodiversity Escape Room:

Challenge #5 = POLLINATORS AND SEED DISPERSING ANIMALS

Read:

A pollinator is any animal that participates in pollination, the transfer of pollen from male plant parts to female plant parts resulting in fertilizing the plant. Once a plant is fertilized, it can reproduce and grow fruits and seeds. Animals such as bees, bats, and butterflies are important pollinators. When a pollinator visits a plant to feed on nectar or pollen, while it’s there, pollen will collect on its body. When it travels to another plant of the same species, the pollen from the first plant will be transferred, and the other plant will be fertilized and produce new seeds. We have pollinators to thank for many of our fruits and vegetables!

Once a plant produces seeds, wind and water will help move the seeds to a new area, where they will grow. Sometimes, animals help with this process as well. When animals eat fruits or berries, their bodies typically can't process the seeds, so the seeds will come out in their poop and grow in that location. Another example is when a squirrel forgets to dig up an acorn that it's buried—it has now planted an oak tree in a new place. Seeds usually grow better when they are in a location away from the parent plant, so these seed dispersers play a helpful role in their environments.

Challenge:

Read the imaginary news article to the right. In the article, there are letters that are incorrectly capitalized that spell out the name of a pollinator. What pollinator is secretly spelled out in the article?

ANSWER:
Biodiversity Escape Room:
Student Handout

Now that we've explored some of the different roles that animals can fill in their ecosystems, we can see how interconnected all living things are. Complete this last challenge with your team to check for understanding.

Part 1: Write your own definition of each term:

Keystone species:

Predator:

Ecosystem engineer:

Pollinator:

Mutualist:

Seed-dispersing animal:

Part 2: Read about each animal below and identify it as having one of the ecosystem roles we've learned about. Draw lines to connect the role and animal matches. HINT: Each of the six roles will only be used once.

Keystone species ○

Ecosystem engineer ○

Mutualist ○

Predator ○

Pollinator ○

Seed-dispersing animal ○

Ladybugs, a type of beetle, drink nectar and eat pollen, which they transport between plants.

Polar bears are at the top of their food chain and spend over 50% of their time hunting for food, usually seals.

Coral have tiny, microscopic algae that live inside of them called zooxanthellae. The zooxanthellae are responsible for giving corals their bright colors and energy, while the corals provide shelter and habitat for the zooxanthellae. They exchange nutrients that they need to survive.

Chimpanzees eat a variety of fruits, including mangoes or guavas. Because they eat the fruit whole and don't get nutrients from the seeds, those seeds are excreted with the chimpanzees' feces, allowing plants to grow in new locations.

Parrotfish primarily feed on algae and dead corals in reefs. After they eat dead corals, they poop small grains of sand, which change the physical environment around them, making it sandier. This helps provide habitat for numerous other species that live in and on the sandy bottom of coral reefs.

Krill are small crustaceans that are a major food source for many marine animals. Krill also feed on phytoplankton and zooplankton, which help cycle nutrients in the ocean as they migrate. The disappearance of krill would upset the balance of their ecosystems, and the food web in oceans near Antarctica could collapse.

ON THE BACK: Come up with your own example of interdependence between species that are not referenced in the activity. Describe the relationships between these animals and how they depend on each other.

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