What Would I Do Without You?

Lesson Plan
grades 5-7

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Introduction
What Would I Do Without You?

Goals
1. To introduce the concepts of ecological interactions, including neutralism, competition, and antagonism with a focus on predation.
2. To use the various animal exhibits at the zoo to show how coevolution works.
3. To use the various animal exhibits at the zoo to show common features among prey and common features among predators.

Learning Objectives
1. Students will be able to define predation.
2. Students will be able to define coevolution.
3. Students will be able to apply the concepts of coevolution.
4. Students will be able to connect how coevolution and adaptation relate.
5. Students will be able to analyze various predators and prey.
6. Students will be able to compare the similarities and differences among predators and among prey.
7. Students will be able to explain how the animals at the zoo have coevolved and adapted.

Materials, Resources, and Preparation
1. Read the introductory material provided in this lesson plan to learn more about key concepts such as predation and coevolution.
2. Make copies of the worksheet to use during the Visit Activity.
Vocabulary

1. **Symbiotic Relationship**- A relationship in which two organisms from different species live in close, direct contact with one another.
2. **Mutualism**- A symbiotic relationship in which both organisms benefit.
3. **Commensalism**- A symbiotic relationship in which one organism benefits and the other is not harmed.
4. **Parasitism**- A symbiotic relationship in which one organism lives off of the other organism; the first organism benefits but the second is harmed.
5. **Antagonism**- When one species benefits from hurting another species. This usually involves one species eating another.
6. **Predation**- The relationship between two species when one, the predator, feeds on the other, the prey.
7. **Coevolution**- When the evolution of one species is very closely related to the evolution of another species.
8. **Mimicry**- When one species evolves to resemble or copy the appearance or behavior of another species.
9. **Adaptation**- The alteration in an organism’s behavior or physiology resulting from natural selection. This change occurs over an extended period of time. Adaptations are tailored to the organism’s environmental niche.

Overview

*Life forms constantly interact with each other in a variety of ways.*

Biological interactions can be studied as relationships between particular species:

When different organisms or species live in close, direct contact with organisms from other species, they have a symbiotic relationship. **Parasitism** (one organism benefits and the other is harmed), **mutualism** (both organisms benefit from working together), and **commensalism** (one organism benefits and the other is not harmed) are types of symbiosis.

In an antagonistic relationship, one species benefits at the expense of another. One example of this is predation, in which one organism, the predator, feeds on another living organism, the prey. Both predators and prey have evolved over time to be more fit in their role. The characteristics of their environment determine traits that are favorable. For example a grassy hill makes being short a favorable trait, because shorter animals will be able to hide better in the grass than tall ones. These traits help some individuals survive longer and produce more offspring, so the traits are passed on to the following generations. When a trait becomes common to most members of the species, it is called **adaptation**. Predators and prey often have special adaptations that help them survive in their particular roles.
One common adaptation is **camouflage**. Both predators and prey utilize this particular feature in a way that is beneficial. Prey use it to hide from predators, while predators can use it to disguise their presence before going in for a kill.

While we generally only think about how the environment helps to shape a species, other life forms also play a major role! In fact, many species have adapted in response to the evolution of other species with which they interact. This is referred to as **coevolution**. This is found commonly between species that are related as predator and prey. For instance, a predator may develop features that specifically help to kill a particular prey. Other predators are more opportunistic, meaning they kill and eat almost anything, and they adapt in more general ways. Some common coevolutionary adaptations of predators include sharp claws, sharp teeth, fangs, and stingers. Prey use passive defenses, such as hiding, mimicry, camouflage, or growing thick hides. With mimicry, a snake may appear to be poisonous, so that it may not be attacked, yet it does not have to spend the energy to actually produce the poison. Prey also use active defenses, like fighting back or running away, in addition to using alarm calls and chemical defenses, such as poison or foul smells.

It is important to remember that many animals can be both predators and prey, and therefore have a combination of these traits. Scorpions, for example, use venom to eat small insects, but they also have thick exoskeletons to provide protection from predators.

It is also significant to remember that there are limitations to evolutionary adaptations. For example, both zebras and lions have evolved to become faster; as the lion chases the zebra, the zebra runs away from the lion. However, this does not mean that the zebra will continue to become faster and faster due to physiological and environmental factors. Keep in mind that adaptations occur over long periods of time and many generations. There are no immediate responses.
Pre-Visit
What Would I Do Without You?

Introduction
1. Tell students that animals can interact with each other in a variety of ways.
2. Tell students there are various types of relationships animals can have.
3. Some of these include:
   - Neutralism
   - Competition
   - Antagonism
4. Ask students if they can name some examples of each type.
5. Tell students that they are going to talk about one of those relationships today: Predation.
6. Ask students what they know about predator-prey relationships:
   - What makes a predator/prey?
   - What behaviors do predators/prey have that makes them successful?
   - What are some factors that affect predator/prey?
   - Too many of each animal?
   - Too few of each animal?
   - Environmental influences?
Activity - Predator Versus Prey Game

1. In this game, your students will play out the different roles involved in an ecosystem that has predators, prey, and several variants of resources that the prey need.

2. The game can play out several initial scenarios. (See left for suggestions.) Let your students play several rounds for each set-up.

Get Ready

1. Take students into an open area to play this game.
2. Determine an area of the space to be a “safe” zone. In the safe zone, prey cannot be captured. Also, determine an area of space to be the “game” zone. In the game zone, prey can be captured.
3. Students will be predators, prey, or resources. Assign each student to their role. You can refer to the “Optional Scenarios” box for suggestions.
   - Prey students will start the game in the safe zone.
   - Predator students will start the game in the game zone.
   - Resource students will also start in the game zone. They must remain still until tapped by a prey student. They can choose to be either food, shelter, or water, and will indicate what resource they are using the appropriate hand symbol.

Optional Scenarios:

To help your students explore the dynamics of the relationship between predator and prey, try out some of these different scenarios.

The following assume a class size of 18; please note the ratios.

Game 1: What happens with too many predators?
Set-up: 3 prey, 9 resources (3 water, 3 food, and 3 shelter), and 7 predators

Game 2: What happens when there aren’t enough resources?
Set-up: 10 prey, 4 resources (1 water, 2 food, and 1 shelter), and 4 predators

Game 3: What makes a balanced system?
Set-up: 7 prey, 10 resources (3 water, 3 food, and 4 shelter), and 1 predator
How to Play

1. At the beginning of the round, the resource students will be turned with their backs to the prey students.

2. To begin each round, randomly call either “food,” “shelter,” or “water.” When this happens, the resource students will turn around to face the prey students; the prey will run and attempt to tag the appropriate resource and return to the safe zone. A tagged resource must run to the safe zone too. The predators will try to tag prey while they run through the game zone.

3. The round is over when all of the surviving prey and any tagged resources have returned to the game zone.

4. At the end of the round:
   - The resources that are tagged and make it to the safe zone become prey.
   - The prey that are taken by predators become predators.
   - The prey that do not catch a resource become resources.
   - The predators that do not catch prey become resources.

5. Before starting the next round, all resources should turn their backs to the prey students, and choose what resource they will be by making the appropriate hand symbols.

6. Play several rounds.

Imagine that your have called “Water!” Prey attempt to tag water resources and return to the safe zone, while predators attempt to tag either prey or any tapped water resource.
Discussion

1. At the end of the game, discuss various aspects of the game:
   - What happened when there was too much or too little of one of the resources?
   - How about when there were too many prey?
   - How about when there were too many predators?
   - What made the prey easy targets?
   - What made the predators better at their job?
   - What would have made it more difficult for prey to be captured?
   - What would have made it easier for predators to capture prey?

2. Encourage students to think about how the features of the predator and prey are related.
   For example, if it is advantageous for the prey to be fast, then the predator must be faster; if the prey can hide, the predator needs better eyes, etc.

3. Next, introduce the concept of coevolution.

4. Explain to students that coevolution has been studied in predator-prey relationships. Explain that as predators evolved, the prey had to adapt in order to survive, and as the prey evolved, the predators had to adapt in order to have enough food to eat; all in reaction to the environment.

5. Explain the concept of adaptation. Some examples include:
   - Predators have claws, teeth, fangs, and stingers.
   - Prey use passive defenses (hiding) or active defenses (fighting back) against the predator.
   - Prey use defense mechanisms, such as alarm calls, camouflage, and thick hides.
   - Prey can use chemical defenses against predators, such as poison or foul smells.
   - Prey may use mimicry as well.
Visit

What Would I Do Without You?

Activity

1. Remind your students about your previous discussion of the evolutionary relationship between predator and prey.
3. Explain to students that during their visit, they will observe various animals. Each student should record their observations for each animal on their sheet.
4. As you tour the zoo, take your students to visit the suggested list of animals on the worksheet.
5. As you visit each animal habitat, ask your students the following questions:
   - Can you name predators or prey of the animal?
   - Which features of the animal would be useful as a predator?
   - Which features of the animal would make it useful as prey?
6. If the animal is in the worksheet, please remind your students to record their observations.

Time: 35 minutes

Materials:
- Do You See What I See? worksheet
- Pencils
- Clipboards
- Notebook

Note:
- You do not have to visit all of the animals on the worksheet, but the more examples you collect, the more fun the analysis will be!
What Would I Do Without You?

Post-Visit Activity

1. Pass back the “Do You See What I See?” worksheets to the students.

2. Make this chart on the board:

<table>
<thead>
<tr>
<th>Predators</th>
<th>Prey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Review the concept of predator and prey if necessary.

4. Ask students to look at the animals on their worksheets that they observed during their visit to the zoo. Tell them to guess whether the animal was mostly a predator or a prey. Fill in the chart accordingly.

5. See Answer Chart 1 on page 12.

6. Remind your students that these distinctions are not cut and dry. Most animals prey on different animals, and are in turn, prey to other animals. Some examples are:
   - Meerkat
   - African Painted Dog
   - River Otter
   - Leopard
   - Bluegill
   - Brook Trout

7. Ask your students to look at the “eye placement” column on their worksheets and, according to the breakdown on the board, draw conclusions. See Answer Chart 2 on page 13.

8. Explain to students that most predators have eyes on the front of their head to be able to catch prey, because it allows them to judge distance. Most prey have eyes on the side of their head to see predators sneak up on them.

9. Ask students to compare/contrast the animals within each category.
   - What are some features that make the predators similar?
   - What are some features that make the predators different?
   - What are some features that make the prey similar?
   - What are some features that make the prey different?

10. Talk about common adaptations that most of these predators/prey have.
    - Camouflage
    - The ability to perform mimicry
    - Sharp teeth
    - Thick hide

Time: 35 minutes

Materials:
- Completed “Do You See What I See?” worksheets

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- Poisonous defenses
- The placement of their eyes
- The ability to run fast

11. Ask the students to match up a predator with its prey, and circle the groupings on the chart.

<table>
<thead>
<tr>
<th>Predators</th>
<th>Prey</th>
</tr>
</thead>
<tbody>
<tr>
<td>African Painted Dog</td>
<td>Giraffe</td>
</tr>
<tr>
<td>Lion</td>
<td>Turkey</td>
</tr>
</tbody>
</table>

12. After all of the pairs are matched, ask students if they can think of any characteristics within the pair that have evolved together.
   (See chart on page 12.)

13. Revisit the concept of coevolution by noting that both types of animals must be continually evolving and changing in order to survive.
## Answer Chart 1

What Would I Do Without You?

<table>
<thead>
<tr>
<th>Predator</th>
<th>Prey</th>
<th>Coevolutionary Adaptations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meerkat</td>
<td>Emperor Scorpion</td>
<td>Some resistance to venom. Venemous barb on tail.</td>
</tr>
<tr>
<td>Lion</td>
<td>Giraffe</td>
<td>Hunt in groups. Strong defensive kick.</td>
</tr>
<tr>
<td>Kodiak Bear</td>
<td>Reindeer (Caribou)</td>
<td>Great strength. Great speed.</td>
</tr>
<tr>
<td>Northern Sea Otter</td>
<td>Purple Urchin</td>
<td>Intelligence. Spines.</td>
</tr>
<tr>
<td>Black Bear</td>
<td>Turkey</td>
<td>Good sense of smell. Good vision.</td>
</tr>
<tr>
<td>American Alligator</td>
<td>White Tail Deer</td>
<td>Eyes and nostrils high on head for stealthy hunting at waters edge. Quick reflexes.</td>
</tr>
<tr>
<td>Leopard</td>
<td>Reeve’s Muntjac</td>
<td>Camouflage for stealthy hunting. Good sense of smell.</td>
</tr>
</tbody>
</table>
**Answer Chart 2**

What Would I Do Without You?

**Directions:**

What do you see at the zoo? Look at the animals listed below and answer the following two questions for each animal. When you are finished, return this worksheet to your teacher.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Where are the eyes located on the animal's head?</th>
<th>What is one feature this animal has that shows it has adapted to its environment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meerkat</td>
<td>Front</td>
<td></td>
</tr>
<tr>
<td>Giraffe</td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>Kodiak Bear</td>
<td>Front</td>
<td></td>
</tr>
<tr>
<td>Zebra</td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>Northern Sea Otter</td>
<td>Front</td>
<td></td>
</tr>
<tr>
<td>Blue Gill</td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>Black Bear</td>
<td>Front</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>Leopard</td>
<td>Front</td>
<td></td>
</tr>
<tr>
<td>Peafowl</td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>Emperor Scorpion</td>
<td>Top and Side</td>
<td></td>
</tr>
<tr>
<td>Lion</td>
<td>Front</td>
<td></td>
</tr>
<tr>
<td>Reindeer (Caribou)</td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>African Painted Dog</td>
<td>Front</td>
<td></td>
</tr>
<tr>
<td>Purpl Urchins</td>
<td>No eyes</td>
<td></td>
</tr>
<tr>
<td>North American River Otter</td>
<td>Front</td>
<td></td>
</tr>
<tr>
<td>White Tail Deer</td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>American Alligator</td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>Reeve's Muntjac</td>
<td>Side</td>
<td></td>
</tr>
<tr>
<td>Tiger</td>
<td>Front</td>
<td></td>
</tr>
</tbody>
</table>

* Each animal is open to a myriad of answers from students that could be relevant. Common answers may be sharp claws, sharp teeth, camouflage, poisons, etc.*
**Worksheet**

*Do You See What I See?*

Name: ________________________________

**Directions:**

What do you see at the zoo? Look at the animals listed below and answer the following two questions for each animal. When you are finished, return this worksheet to your teacher.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Where are the eyes located on the animal’s head? (Front? Sides?)</th>
<th>What is one feature this animal has that shows it has adapted to its environment?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meerkat</td>
<td></td>
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</tr>
<tr>
<td>Lion</td>
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<td></td>
</tr>
<tr>
<td>Reindeer (Caribou)</td>
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<td>African Painted Dog</td>
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<td>Purpl Urchins</td>
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