

Ecological Interactions Activity

Student Handout

Background

A **niche** is the way of life of a species, or its role in an ecological community (what it eats, where it lives, how it interacts with other species, etc). For example, the niche of a honey bee is the time of day it is active, the type of flowers it gets nectar from, the temperature range it can survive, where it builds its hive, which other species it interacts with, and how it interacts with those other species (mutualism, parasitism, commensalism, etc). Another way of thinking about a niche is that it is the sum of the **biotic** (living) and **abiotic** (nonliving) resources that a species uses.

Species do not live by themselves—they live in ecological communities and are constantly interacting with other species. Something that affects one species will impact all the other species it interacts with. For example, if a frog species goes extinct in a community, then the snakes that usually eat it will have to find another food source or they will go extinct as well. And since there are no more frogs left to eat the moths, the moth population might increase so dramatically that it becomes out of control and eats all of the plants in the community, leaving no food for other plant eaters.

Species can have many different types of interactions with each other, some interactions help both species, some help just one of the species, and some can be negative for one or both of the species. All of these interactions are needed to maintain balance in an ecosystem. **Symbiosis** means “to live together,” and happens when two species have a close relationship with each other. Interactions that fall under the category of symbiosis are *mutualism*, *parasitism*, and *commensalism*.

Parasitism is an interaction that harms one species and benefits the other species. A parasite lives on or in a host organism. For example, tarantula wasps lay eggs in tarantulas. This benefits the wasps because the larvae eat the tarantula’s tissues, killing the tarantula. Other types of interactions that harm one species and benefit the other are **predation** (where a predator eats its prey) and **herbivory** (where the consumer eats a plant species).

Competition is an interaction that harms both species. Two species are competing for a limited resource. This reduces the fitness of one or both of the species. For example, hyenas chase away vultures that are trying to eat the remains of the same zebra.

Mutualism is a type of interaction where both species benefit each other. For example, bees and flowers have a mutualistic relationship. The flowers need to bees to pollinate them so their seeds can be fertilized. Bees need flowers to make honey for their hives.

Commensalism is an interaction that benefits one species and does not affect the other species at all. For example, while cattle graze in fields they unintentionally stir up insects that were resting in the grass. Cattle egrets follow the cows’ paths and eat these insects. The egrets benefit because cows help them find food. The cows are not benefitted or harmed by the egrets.

Interaction	Species 1	Species 2
Mutualism	+	+
Competition	-	-
Parasitism, Predation, and Herbivory	+	-
Commensalism	+	neutral



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Some species are **generalists**, meaning they can eat many different types of foods. Raccoons are generalists, since they can eat many different foods such as eggs, bugs, nuts, birds, and berries. Other species are **specialists**, meaning they eat only a certain type of food. Koalas are specialists, since almost their entire diet is eucalyptus leaves.

Protocol

1. Fill out the introduction portion of the handout as a class.
2. M&M Activity
 - a. Put students in groups of 3. Each student is a different species (Species A, B and C).
 - b. Each group gets a bowl of M&Ms. Each student gets a spoon, cup, and set of note cards.
 - c. For each round, have students read the instructions on their note card about how they can survive the winter. Students should keep their instructions hidden from other group members.
- d. With the bowl of M&Ms in the center of each group. Students will use a spoon to collect M&Ms and place them into their cups. No stealing from other student's cups unless your instructions tell you to do so.
 - e. Each round lasts 1 minute (or less). At the end of the round, students should record how many M&Ms each species collected, then return the M&Ms to the community bowl and answer questions.
3. Have students answer the elaboration questions at the end of the handout, then discuss as a class.





Introduction

A **niche** is: _____

Symbiosis means _____ and happens when two species have
_____.

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Interaction	Species 1	Species 2	Definition	Example
<p>1. Parasitism (parasite lives on or inside of a host)</p> <p>2. Predation (predator eats prey)</p> <p>3. Herbivory (organism eats a plant species)</p>				 <p>Tarantula wasps lay eggs inside of tarantulas while they're still alive.</p>
Mutualism				 <p>Bees pollinate flowers.</p>
Competition				 <p>Hyenas and lions both try to eat the same prey.</p>
Commensalism				 <p>Egret birds eat insects that cows & horses disturb.</p>

A **generalist** is a species that can eat many different types of foods. For example, raccoons eat many things, including human garbage!

List another example:



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A **specialist** is a species that eats only a certain type of food. For example, koalas only eat eucalyptus plants.



List another example:

Activity Instructions:

Each person in your group represents a different species (Species A, Species B, and Species C), so each person gets a different stack of cards. Don't let anyone else see the instructions on your card, or they'll have a better chance of beating you!

Put the bowl of M&Ms in the center of your group, and give each group member a spoon. Use the spoon to collect M&Ms—*only one at a time*. Leave your cup on the table, not in your hand. No cup guarding! At the end of the round, count how many M&Ms you collected, fill out the table, and answer the related questions. Then, put all of your M&Ms back into the community bowl for the next round.

Round 1			
	Species A	Species B	Species C
Number of M&Ms in the cup			
Did this species collect enough food to survive the winter?			

1. Which two species occupied the same niche in this community? How do you know?

2. Which ecological relationship does...

a) ...Species A and Species B have?
(mutualism / parasitism / competition / commensalism / none)

b) ...Species A and Species C have?
(mutualism / parasitism / competition / commensalism / none)

c) ...Species B and Species C have?
(mutualism / parasitism / competition / commensalism / none)

3. Why will two species not be able to occupy the same niche in a community for very long?



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4. Was your species a generalist or a specialist? Why?

Round 2			
	Species A	Species B	Species C
Number of M&Ms in the cup			
Did this species collect enough food to survive the winter?			

5. Which ecological relationship does...
- a) ...Species A and Species B have?
(*mutualism / parasitism / competition / commensalism / none*)
 - b) ...Species A and Species C have?
(*mutualism / parasitism / competition / commensalism / none*)
 - c) ...Species B and Species C have?
(*mutualism / parasitism / competition / commensalism / none*)
6. Was your species a generalist or a specialist? Why?
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Round 3			
	Species A	Species B	Species C
Number of M&Ms in the cup			
Did this species collect enough food to survive the winter?			

7. Which ecological relationship does...
- a) ...Species A and Species B have?
(mutualism / parasitism / competition / commensalism / none)
 - b) ...Species A and Species C have?
(mutualism / parasitism / competition / commensalism / none)
 - c) ...Species B and Species C have?
(mutualism / parasitism / competition / commensalism / none)

Round 4			
	Species A	Species B	Species C
Number of M&Ms in the cup			
Did this species collect enough food to survive the winter?			

8. Which ecological relationship does...
- a) ...Species A and Species B have?
(mutualism / parasitism / competition / commensalism / none)
 - b) ...Species A and Species C have?
(mutualism / parasitism / competition / commensalism / none)
 - c) ...Species B and Species C have?
(mutualism / parasitism / competition / commensalism / none)



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Elaboration Questions

9. If the environment changed suddenly, for example because of global warming, do you think generalist or specialist species would be better able to adapt and avoid going extinct? Why?
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10. What would happen if a new invasive species came into your ecosystem that ate blue, red, and orange M&Ms and was better at collecting food than all three of your species?
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11. Using what you have learned about ecological interactions, think an example of each interaction in which humans are involved:
- a. Competition: _____
- b. Parasitism: _____
- c. Mutualism: _____
- d. Commensalism: _____
12. “All populations living together within a community interact with one another and with their environment in order to survive and maintain a balanced ecosystem.” Do you agree with this statement? Why or why not?