



## SYMBIOSIS, MUTUALISM, PARASITISM, AND MORE

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**Grade Level:** 6-12<sup>th</sup>

**Introduction:** All organisms participate in relationships with organisms of different species in ecosystems. Some relationships benefit the organisms and are essential for both species to survive. Others are detrimental to one organism, but critical for the other organism and still essential to the interdependence of species within the ecosystem. Through examination of different organisms with the tropical montane cloud forest ecosystem, students will learn about the different forms of symbiosis.

**Major Themes:** Interdependence, Ecosystems

**Connections to the National Science Standards:** Interdependence of Organisms, Populations and Ecosystems

**Time:** 50 minutes (5 min for opening, 25 minutes for exploring media and completing Relationship chart, 10 minutes for index cards and discussion, 10 minutes for closing)

**Materials:** One computer with internet access and LCD projector. More computers can be incorporated into lesson plan if available. *Canopy In The Clouds* media:

- Panorama #1, Hotspot #7 “Leaf Cutter Ants”
- Panorama #2, Hotspot #1 “Site Introduction”
- Panorama #3, Canopy Hotspot #1 “Microclimate & Plants”
- “Strangler Fig” Media video

Additional examples of symbiotic relationships as desired by teacher. Four labeled index cards per group of students. Student handouts included.

**Objectives:** Students will be able to 1) differentiate between the three types of symbiotic relationships present within ecosystems 2) identify examples of symbiosis within the cloud forest 3) explain the importance of symbioses to the cloud forest ecosystem.

**Potential Misconceptions:** Students may have the following misconceptions:

- 1) Students may believe that symbiosis and mutualism are synonymous. Clarify that symbiosis is any long-term relationship between two or more species. Mutualism is a *type* of symbiosis, as is commensalism and parasitism.
- 2) Predation is similar to parasitism in that one organism benefits and the other is harmed. Remind students that symbiosis is a long-term relationship between organisms, thus excluding the short-term relationship in predation. Use of the terms parasite and host will help to differentiate between parasitism and predation, as will thorough examples. Help students to further understand the distinction between these interactions by explaining that predation results in death for the prey, but in parasitism the host remains alive.



## PROCEDURE

**Opening:** Give students three minutes to write down relationships that they are a part of in their lives. They may include a brief description to help you and other classmates understand. For example: I have a relationship with my teacher- s/he helps me to understand and I learn new things. Encourage students to include examples of relationships that might not include other humans and examples of relationships that they may not necessarily enjoy. Ask students to place a [+] sign next to the individual(s) that is benefitting from the relationship, a [-] sign next to the individual(s) that is being harmed by the relationship, and a [0] next to the individual(s) who are unaffected by the relationship.

Ask students to share their answers. Divide the board into three sections and group the relationships that are similar, along with the associated signs. Do not label the three sections, as the class will do this at a later time. Know that you are grouping the relationships into commensalism, mutualism, and parasitism.

Explain that the class will be looking at relationships between species within ecosystems, specifically the tropical montane cloud forest of Monteverde, Costa Rica. They will be working towards finding the answer to the following question: What types of relationships are present within ecosystems?

**Development:** Place students into groups if more than one computer is available for use, or prepare the entire class to view *Canopy In The Clouds* media together via LCD projector. Ask students to complete the chart on page 1 of the student handout packet: *Relationships in Ecosystems* as they work. Students will identify the individuals involved in the relationship, what they are doing, and if each individual is harmed, benefitting, or neither. Ask students to leave the two right columns blank at this time. Blank spaces are provided if additional examples of relationships are desired. Check in with individuals or student groups to ensure they are completing the chart correctly, as some spaces will need to be filled with the word “none”.

Give students three minutes to share their thoughts with a partner. Students should discuss any similarities or differences they have in their answers and explain how they came to those answers. Ask volunteers to share answers with the class.

Next, pass out a set of four index cards to each group. Each index card should have one of the following explanations:

- Symbiosis: any long-term relationship between two organisms from different species
- Mutualism: a type of relationship in which both organisms benefit
- Commensalism: a type of relationship in which one organism benefits and the other is unaffected
- Parasitism: a type of relationship in which one organism is harmed and the other benefits

(Note: There is an additional type of relationship “ammensalism” [0,-], which is not addressed herein).



Ask students to assign an index card to each relationship in their chart. Answers may be used more than once if additional examples are provided. Students are to write their choices in the “Type of Relationship” column of their relationship chart. When complete, ask students to share their answers. Engage them in a discussion that involves the following questions:

- What did you observe about the relationships that you labeled “mutualism”?
- What did you observe about the relationships that you labeled “commensalism”?
- What did you observe about the relationships that you labeled “parasitism”?
- Was there a note card that you did not use at all?
- Was there a note card that you used every time?

Students may struggle with the placement of the “Symbiosis” card, placing it on every relationship. Using the concept map on page 2 of the student handouts, help students to understand that symbiosis is an umbrella term that classifies all of the relationships. Each of the relationships are examples of symbiosis, but using the terms “mutualism,” “commensalism”, and “parasitism” provides more information about the interactions between the species involved.

Go back to the relationships listed on the board from the opening activity. Using the information they have learned about symbiotic relationships and the +, -, 0 symbols, ask students to classify each section of the board as mutualism, commensalism, or parasitism.

**Closing:** Finally, students should complete the “Importance” column of the relationship chart individually or with a partner. Ask students to think about the following questions as they determine the importance of each relationship examined:

- What would happen to one of the organisms if the other was no longer present?
- What would happen to the cloud forest if both of the organisms were no longer present?
- Why is this relationship important?

Discuss answers as a class or ask students to focus on one relationship seen within the cloud forest, completing an in-depth reflective paragraph that answers the above questions.

**Suggested Student Assessment:** Students can complete page 3 of the handout, *Student Assessment: Symbiotic Relationships*. Students are asked to examine another example of relationships between several species within the cloud forest ecosystem. Students must identify the types of symbiotic relationships present, discuss the importance of those relationships to the ecosystem, and complete a Venn diagram to demonstrate their mastery of different symbiotic relationships.

**Extending the Lesson:** Explain that students will become “investigators” and find another example of a symbiotic relationship. Ask them to create a WANTED poster. This might be a parasite looking for a new host, or an organism in a mutualism relationship looking for another organism to participate. Posters should be based on factual information and real symbiotic relationships.



Posters may be completed for homework and then used the following class as a rotational activity, in which students will examine classmates' posters and identify the type of symbiotic relationship represented. Posters may also be completed in a following class as a more in-depth research project/assessment.

**Vocabulary:** symbiosis, mutualism, commensalism, parasitism