

Interactions of Organisms Lesson 1: *The Solve* Educator's Resource Guide

Objective

In *The Solve*, students will:

1. Solve a mystery involving different types of relationships among organisms in a coral reef ecosystem.
2. Create a Mind Map to explore relationships among Interactions of Organisms vocabulary.
3. Communicate understanding that organisms within an ecosystem can have relationships that are competitive, mutually beneficial, or predatory.
4. Communicate understanding that abiotic factors can impact the health of organisms within an ecosystem.

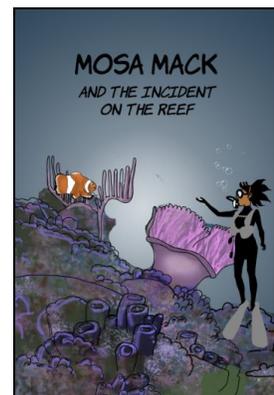
Time Required: 40-75 minutes

Materials Required	Safety Considerations	Science & Engineering Practices
<ul style="list-style-type: none">● Student Guide (<i>includes student agenda and Mind Map</i>)● Mosa Mack "Interactions of Organisms" Comic/Motion Comic● Scissors● Glue or tape	None	<ul style="list-style-type: none">● Developing and using models● Constructing explanations or arguments from evidence

Mosa Mack Comic Episode Description

The clownfish is the life of the party, but on his way to his final booking, he suddenly disappears. His assistant searches for him, only to find his remains on the ocean floor.

Mosa and her crew dive in to help. While in the ocean, they encounter a number of different animals and learn about the different relationships among species in the coral reef ecosystem, including ones that are mutually beneficial, competitive, and predatory. After careful examination, Mosa thinks she may have identified the Clownfish Killer.



Inquiry Scale: Leveling Information

The Solve can be completed in various settings, including presentation-style, small groups, or individually. In the case of a flipped or blended classroom, it can be completed entirely at home.

Level 1: Most teacher-driven (*recommended for grades 4–5*)

View the animated mystery twice: once in full, and a second time along with the discussion questions, pausing the video as needed to answer the episode questions as a group. Project and complete the Mind Map as a class-wide activity. This can be done digitally or on paper. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 2 (*recommended for grades 5–6*)

View the animated mystery in full. Afterwards, have students work through the episode questions to the best of their ability in small groups. Play the mystery a second time, pausing the video to discuss each question. Direct students to complete the Mind Map in small groups, either digitally or on paper. Come back as a class to review correct answers, as needed. Have students informally quiz each other on the vocabulary until you feel they're familiar with the terms. Use the discussion questions at the bottom of the Mind Map to have a group discussion. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 3 (*recommended for grades 6–7*)

Provide students with their student URL and have students view the animated mystery in small groups. Have students play the animated mystery once in full and then answer episode questions in their table groups to the best of their ability. Then, as a class, project the mystery, pausing, as needed, to discuss episode questions in a think-pair-share format. Have students complete the Mind Map in table groups, either digitally or on paper. Have students quiz each other on the vocabulary until you feel they're familiar with the terms. In table groups, have students go through the discussion questions on their own, and review answers as a class. Finally, have students complete the quiz digitally or on paper as an exit ticket.

Level 4 (*recommended for grades 7–8*)

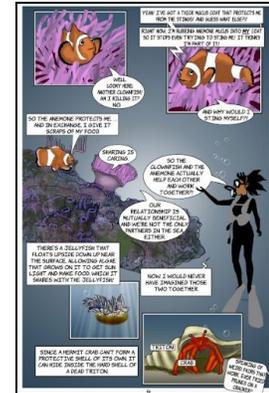
Provide students with their student URL and have students view the animated mystery and complete episode questions in pairs. Have students review their answers with a neighboring table group. Have students complete the Mind Map in pairs, either digitally or on paper. Have students quiz each other on the vocabulary until they feel they're familiar with the terms. Have these same pairs go through the discussion questions. Finally, have students complete the quiz digitally or on paper as an exit ticket.

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Agenda

I. Solve the Interactions of Organisms Mosa Mack Mystery (20 minutes)

Differentiation Tip: The comic book and motion comic video can be read/watched as a class, in small groups, individually, or completed for homework. For additional support, students can read or watch the comic/episode twice: once before completing the questions, and once with teacher guidance, pausing to discuss each answer.

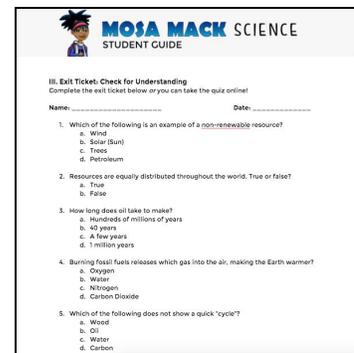


1. Read/watch the Mosa Mack Mystery on Interactions of Organisms.
2. Students answer the questions in their Student Guide as they read/watch. Encourage students to cite the specific page numbers/time codes in the Comic Mystery to promote writing with supporting evidence. Answers can be found in the key below.

II. Vocabulary Mind Map Activity (15–45 minutes)

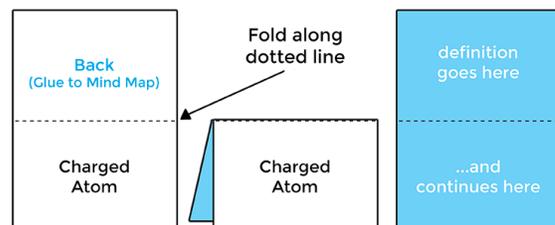
Differentiation Tip: The Mind Map can be done as a class, in small groups, individually, or completed for homework.

1. Students may complete the Mind Map **digitally**. Follow directions below. (15 minutes)
 - a. Go to



<https://mosamack.com/home/interaction-of-organisms>

- a. Select **Lesson 1: The Solve**.
 - c. Select **Vocabulary** and complete **Part 1**: matching terms with definitions.
 - d. Complete **Part 2**: matching terms and definitions with images on a diagram.
2. To complete the Mind Map **on paper**, follow the directions below (45 minutes).
 - a. Print and pass out the Student Guide: Interactions of Organisms Lesson 1: *The Solve*.
 - b. Introduce the warm up task: students will be making a Mind Map of the vocabulary for this Interactions of Organisms unit.
 - c. Model the directions carefully, emphasizing the following. Students should:
 - **cut** out the vocabulary cards on the solid lines only
 - **fold** the cards at the dotted lines



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- write the definition of the term on the inside of the card using definitions provided
- d. Students use the clues from the Mind Map images, definitions, and terms to place the cards in the correct location in the Mind Map.
- e. Check that the students have matched their cards correctly before moving on.
- f. Students use glue or double-sided tape to connect the back of the vocabulary card to the correct place on the Mind Map.
- g. Students discuss the questions with their group or as a class when they have completed the Mind Map.

Teacher Tips:

- Since this is the first time many of the students will have seen these vocabulary terms, have students work together to use the images, definitions, and collaborative thinking to figure out where the terms go.
- Check in on student groups through this process. When you see a student or group who has placed a card in the correct place, ask a facilitating question such as, “Why do you think that term goes there?” or “What evidence leads you to believe that term goes there?” When students explain their thinking, this is a great opportunity to provide positive reinforcement. Then, encourage students to share their reasoning to the class or to other groups who may have trouble identifying the location of that specific term.
- If you do not have access to a color printer, provide students with black and white copies and project the colored version of the Mind Map at the front of the room so that students can reference both images.

III. Exit Ticket: Check for Understanding (10–15 minutes)

Differentiation Tip: This can be done in groups, pairs, individually, or more formally as a quiz online.

1. Students complete the exit ticket to check for understanding. This can be done online by selecting the **Quiz** button in Lesson 1 or on paper in the Student Guide. Answers are in the key below.

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Answer Key

Mind Map Discussion Questions

- a. If all Arctic bumblebees were removed from the ecosystem, how would Arctic poppy plants be impacted?

The Arctic poppy plants would have a difficult time reproducing since they rely heavily on the Arctic bumblebee for pollination. This would likely reduce the Arctic poppy population.

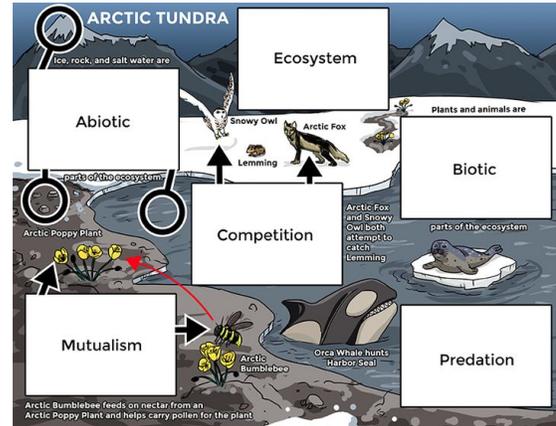
- b. What are abiotic factors in an ecosystem and why are they important in an ecosystem?

Abiotic factors are nonliving components of an ecosystem, such as rocks, soil, sunlight, ice and water. These impact on biotic factors (those related to living things) in the ecosystem. Abiotic parts of the ecosystem impact the ecosystem in many ways. They provide shelter and other resources necessary for organisms to survive.

- c. Polar bears also feed on seals in the arctic ecosystem. If a polar bear was introduced to this environment, what type of relationship would it have with the orca whale?

A polar bear would have a competitive relationship with the orca whale because both species would compete for similar food resources (seals) in the environment.

Mind Map



Episode Questions

1. Why was Mosa Mack called to the scene? What was the initial problem she had to solve? (pages 1-2) (0:55-1:10 motion comic)
Mosa was called to the scene because the clownfish had been killed. The initial problem she had to solve was "what animal killed the clownfish?"
2. What is the relationship between sea anemones and clownfish? What does it mean for species to have a mutually beneficial relationship? (page 4) (2:45-3:25 motion comic)
The sea anemone and the clownfish have a mutually beneficial relationship. In this type of relationship, both species benefit from one another. In this particular relationship, clownfish are resistant to the stinging cells of sea anemones and find shelter in the anemone's "stalks." The sea anemone benefits because the clownfish will provide it with scraps of food and will defend it against predators such as the butterflyfish who feed on the sea anemone.
3. Describe two species (other than sea anemones and clownfish) that have a mutually beneficial relationship that you learned about in the mystery. (pages 4-5) (3:25-4:20 motion comic)
Answers will vary. Potential answers include:
 - *The jellyfish and algae: jellyfish float upside down and provide a space for algae to grow. The algae absorbs sunlight to create food, providing food for the jellyfish.*
 - *The bluestreak wrasse and lizardfish: the bluestreak wrasse eats parasites off the lizardfish, obtaining food. The lizardfish benefits from the removal of the parasites and stays healthy.*

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4. What do the clownfish and butterflyfish compete over? (page 6) (4:50-5:40 motion comic)
The clownfish and the butterflyfish compete over the sea anemone. The clownfish relies on the sea anemone for shelter and protection while the butterflyfish feeds on the sea anemone as a source of food.
5. Describe two other species that have a competitive relationship that you learned about in the mystery. (page 6) (5:45-6:05 motion comic)
An example of two other species that have a competitive relationship are the ghost crab and hermit crab who compete for dead fish. When the dead fish wash up on land, the ghost crab will typically obtain the food source, but when the dead fish sink underwater, the hermit crab benefits.
6. How can a change in water temperature impact species in the coral reef? (page 7) (6:25-6:45 motion comic)
When ocean water temperature rises too much, coral is negatively impacted and can die. A lack of coral in the ocean will impact other animals, such as the clownfish who lays eggs in the coral, lives in the coral, and eats organisms that grow on coral.
7. What type of relationship exists between the bluestriped fangblenny and the lizardfish? (page 9) (7:35-7:48 motion comic)
A predatory relationship exists between the bluestriped fangblenny and the lizardfish. Extended explanation: The bluestriped fangblenny imitates the bluestreak wrasse in order to attract the lizardfish (the bluestreak wrasse shares a mutually beneficial relationship with the lizardfish by removing parasites from the lizardfish). Instead of cleaning it, the bluestriped fangblenny attacks the lizardfish and rips out its flesh.
8. What did Mosa figure out? Who killed the clownfish? Explain your reasoning. (Answer Comic)
Mosa determined that the lizardfish killed the clownfish. When reporting the crime, the bluestreak wrasse said he spoke to the clownfish at 2:02pm. But later, the bluestreak wrasse lied and stated that he was cleaning parasites off the lizardfish at 2:02 in the afternoon. Mosa worked out that the bluestreak wrasse could not have been with the lizardfish if he was on the phone to the clownfish at that time. The bluestreak wrasse lied to protect the lizardfish with whom he has a mutually beneficial relationship. Mosa had already learned that the lizardfish is a predator of small fish, including the clownfish. With this information and by revealing the lie, Mosa worked out that the lizardfish was the guilty party.

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Quiz:

- The “stalks” of a sea anemone are:
 - Tentacles that sting and kill, helping the sea anemone protect itself**
 - Eyes of the sea anemone
 - Intestines of the sea anemone that help to digest food
 - Mouth parts that help the sea anemone to capture food
- In a mutually beneficial relationship:
 - Species compete for resources in the environment
 - One species hunts another for food
 - Species help one another; each benefits the other in some way**
 - One species benefits while the other is neither helped nor harmed
- True or false: Animals are considered competitors if they compete for the same food source.
 - True**
 - False
- Which of the following relationships would be considered competitive in the ocean ecosystem?
 - Clownfish and sea anemone
 - Lizardfish and bluestriped fangblenny
 - Clownfish and butterflyfish**
 - Jellyfish and algae
- Which factor does NOT significantly impact the ocean environment of a coral reef?
 - The temperature of the water
 - The amount of sunlight hitting the coral reef
 - The amount of salt in the water
 - The height of waves crashing on the shore**
- Which of the following describes a predatory relationship?
 - Clownfish hiding in the sea anemone for protection
 - Hermit crab finding shelter in the shell of a dead triton
 - Ghost crabs and hermit crabs competing for dead fish
 - Sharks feeding on smaller fish in the ocean**
- True or false: species of plants and animals that live in the ocean can interact in a variety of ways: killing one another, being friendly with one another, or even being enemies of one another
 - True**
 - False