GENERATIONGENIUS
ALWAYS QUESTION. ALWAYS WONDER.

LESSON PLAN

COMPETITION IN ECOSYSTEMS
GRADES 6-8

SUMMARY

Students will engage in an investigation to figure out and explain ecosystem interactions.

NEXT GENERATION SCIENCE STANDARDS CORRELATION

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Science & Engineering Practices	Connections to Classroom Activity
Analyzing and Interpreting Data	• Students participate in an investigation to collect data to use as evidence in developing an explanation.

Disciplinary Core Ideas	Connections to Classroom Activity
LS2.A: Interdependent Relationships in Ecosystems In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Growth of organisms and population increases are limited by access to resources.	• Students participate in class discussion and an investigation about the interactions of an ecosystem, including competition for the same resources. • Students watch a video to gather more information on ecosystem interactions.

LS2.C: Ecosystem Dynamics, Functioning, and Resilience Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.	
Cross Cutting Concepts	**Connections to Classroom Activity**
Cause and Effect	• Students investigate what happens when resource availability changes. Students make predictions about how environmental factors also affect relationships in an ecosystem.

DURATION

90 min. (or two 45 min. class periods)

This lesson builds on science ideas developed in the grade 3–5 Adaptations and the Environment video and lesson.

MATERIALS

- Plastic container filled with dried beans
- Paper plate with 50 dried beans in a single layer
- Timer
- Plastic spoon
- Clothespin or tweezers
- Plastic knife or similar flat and narrow object

ENGAGE

Tell students you have an interesting phenomenon you want to share with them. Have students create a t-chart. Write *Notice* on one side and *Wonder* on the other side. Tell students to record observations in the notice column and questions in the wonder column. Play the Ducks, Seagulls, and Fish Fighting Over Food video from 3:55–5:10 minutes. Students may wonder things such as the following: *Will the ducks ever get to eat? Will the fish eat the ducks? and What else do ducks and fish eat?* At the end of 3 minutes, ask students to share their observations with a partner.
Next, ask students to share their observations and questions with the class. Record these whole-class observations on a projection screen, white board, dry erase board, chalkboard, or some other surface that all can see.

Discuss the interactions students observed in the videos, and ask students if they can share other examples of similar interactions they have observed. As students share, create a list of the organisms they discuss. After students have shared, have them work in small groups to use the list to make a food web using as many organisms as they can.

If students are missing important organisms from the food web, use prompts to help them recognize these organisms, for example:

- Has anyone seen any interactions involving insects?
- Is anything in our environment missing from this list?
- Can we think of any interactions that involve plants?

When groups are finished with their food web models, have students participate in a gallery walk to provide feedback on other group models. Remind students that feedback needs to be based on evidence and not opinion and questions need to be for the purpose of clarification. Students may revise their food web models based on feedback from their peers.

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EXPLORE

Ask students what other things we find in our environment that are not represented in our food web models. Then review with students the difference between living and nonliving things, if needed. Facilitate a discussion about how nonliving and living things interact within ecosystems.

Ask students for their thoughts on how many of each animal might exist in the ecosystem (size of population) and if they think the populations have limits. Lean into student ideas that surface about resources within ecosystems being limited.

After the discussion, have students brainstorm ideas from the discussion that are not represented in their food webs. Possible student ideas include the following:

- Animals compete for resources like food.
- Plants also need things to survive like space and sunlight.
- Invasive species can invade places where they don't usually live.
- Things like drought, fires, and flooding can affect ecosystems.

Conducting the Investigation

This investigation will allow students to collect data to identify how animal characteristics help animals get the food they need to survive, grow, and reproduce.

Ask students to create a data table in their notebooks, on their electronic devices, or on a piece of paper (see sample data table).

Hand out the materials to student groups. Allow students to look at the different tools for gathering food, and ask them what they think the tools represent. Agree that the tools represent different bird beaks. Before they begin, students should write a claim about what "beak" will best allow for survival.

Explain that the goal is to collect enough beans to survive to the next feeding. Students will need to collect 10 beans in 30 seconds in order to survive. If 10 beans are not collected, then that organism did not survive and should not continue with the feeding rounds.

Place students in groups of four. One student will time each feeding, and the other three will compete for food. Use the bowls for the first set of feedings. Bowls should have at least 50 beans, and all students will compete at the same time. Bowls represent when food is in abundance (the first set of feedings).

The next season, there is a drought, and food is not as abundant. Before students begin the "drought" investigation, ask them to make a prediction about how well their organism (beak type) will do in terms of obtaining food when food is scarce. **All species participate in Feeding Round 1 of the "drought" investigation.**

When the investigation is finished, have students share their data. Ask them what patterns they notice in the data. Did the data support or refute their claim?

End of Day 1

EXPLAIN

Have students work in their groups to analyze the data they have collected to determine if the data support or refute their claims. Tell students to look for patterns in their data that they can use to develop an explanation for how resources affect competition between animals. Have them write down their ideas.

WATCH THE GENERATION GENIUS COMPETITION IN ECOSYSTEMS VIDEO AS A GROUP

After the video, have students create a poster explaining some of the interactions they figured out during the discussion, the investigation, and the video. Some explanations that could be included are the following:

- Food web interactions
- Competition interactions (from the investigation)
- Changes in interactions because of environmental factors (e.g., drought, fire, invasive species)

Have students present their posters.

ELABORATE

Circle back to the phenomenon video from the Engage step. Have students work in small groups to think about the interactions they observed in the video. Ask them how they used what they figured out about ecosystems to explain the interactions in the video with the fish and the ducks.

Say, “We can see that people are feeding the ducks and fish bread. How is this different from what we see in nature?” and “How can we use human-made situations like the ducks and fish to help us figure out things about ecosystems?” After a short class discussion about these questions, have students move on to the Evaluate step.

EVALUATE

There are multiple ways to assess your students’ understanding of this topic. The exit ticket is an opportunity for students to use the science ideas they built in the lesson in a new context. Alternatively, you can use the Kahoot! quiz (which provides downloadable scores at the end of the game) and/or the paper quiz. All these resources are located right below the video in the assessment section.

EXTENSION

Extension activities to explore include linking ecosystem interactions to evolution. How does the need for populations to adapt to changes in their environments affect the population of a species as a whole? Consider the investigation activity. Will the species that doesn’t get enough food eventually become extinct, or will the remaining population learn to adapt to a new food source or relocate to a new ecosystem?

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