GENERATIONGENIUS
ALWAYS QUESTION. ALWAYS WONDER.

TEACHER GUIDE

SYMBIOSIS

GRADES 6-8

COMMON MISCONCEPTIONS

- **Consider effects on individuals, not on the population.**
  Students may find it difficult to think in general terms about the roles organisms play within ecosystems. They tend to reason about effects on individuals, not on populations.

- **Focus on one-way patterns of interactions.**
  Students also tend to focus on simple, one-way patterns when thinking about two-way processes. For example, when bees pollinate flowers, both the bees and the flowers benefit. However, students often focus on the "active" role, so they see a bee as benefiting from a flower but don't realize that the flower also benefits. Students may realize that an owl population benefits from eating mice but may not realize that the mouse population benefits from having their numbers kept in check.

- **Think causality is linear and direct.**
  Students typically use a simple, linear causality in their learning of any science concept. They reason that one thing directly makes another thing happen. They also tend to focus on obvious variables—ones they can perceive directly. Yet ecosystems are amazingly complex systems that are greatly affected by non-obvious and obvious variables.

ECOSYSTEMS

An ecosystem is a system that includes all living organisms (biotic factors) in an area as well as its physical environment (abiotic factors) functioning together as a unit. Matter and energy are constantly exchanged between living organisms and the environment. Food webs can be used to model those interactions.

SYMBIOSIS

Symbiosis is the interaction of two different organisms in an ecosystem. These interactions can be harmful, beneficial, or have no effect. Understanding these interactions is important for predicting how ecosystems will respond to disturbances. These patterns of interactions can be found across ecosystems.

TYPES OF SYMBIOSIS

There are five types of symbiosis:

1. Predation: One animal eats another animal.
2. Competition: Two organisms compete for the same resource. The resource can be biotic (e.g., the same prey) or abiotic (e.g., water or minerals).
3. Parasitism: One organism (the parasite) lives on or in another organism (the host) causing harm to the host. Parasites are adapted structurally to this way of life. Parasitic relationships can occur in plants and animals.
4. Mutualism: Two different organisms associate and both benefit. Mutualism can occur in plants and animals.
5. Commensalism: In this relationship between two species, one species benefits from the other without either harming or benefiting it.

TEACHER TIPS

- Model the use of the Symbiotic Relationships organizer using the Cordyceps and ant example from the Engage video.
- To use class time more efficiently, randomly assign students within each small group a different relationship to find examples of and to record on their group's organizer. Having the organizer as a Google document allows students to enter information simultaneously.
- After students have shared their conclusions in the Explain stage, wrap up by comparing their ideas with those of the "expert" by playing the last 20 seconds of the "Killer Zombie Fungus" video.

ABOUT THIS LESSON

This lesson was created by the National Science Teaching Association (NSTA) to pair with the Generation Genius video and support *NGSS*.

They have requested we provide the following background with this lesson:

The Next Generation Science Standards (NGSS) are the national standards on how students learn science, and they are based on contemporary research presented in *A Framework for K–12 Science Education (the Framework).* The shift in science teaching and learning required by the Framework is summarized in this infographic: A New Vision for Science Education.

At the start of each Generation Genius lesson, students are presented with a phenomenon, then they try to explain it. Students will notice they have gaps in their knowledge and ask questions, which motivates them to build ownership of science ideas they need in order to explain how or why the phenomenon occurred. The way students build ownership of science and engineering ideas is through active engagement in the science and engineering practices (SEPs). This process of sensemaking, or doing science to figure out how the world works, is one of the major shifts the *Framework* encourages.

To engage in the SEPs, students should be part of a learning community that allows them to share their ideas, evaluate competing ideas, give and receive critiques, and reach consensus. Students can start by sharing ideas with a partner, then with a small group, and finally, with the whole class. This strategy creates opportunities for all students to be heard, build confidence, and have something to contribute to whole-class discussions. Each Generation Genius lesson provides conversational supports to facilitate such productive student discussions to contribute to sensemaking.

Excited to continue your shift toward the new vision for science education? Check out the Generation Genius Teacher Guide page on the NSTA website for resources and strategies to engage every student in your classroom in **doing** science.