Organisms in Symbiosis

Strand	Biological Communities	
Topic	Investigating fungal symbiosis	
Primary SOL	LS.8	The student will investigate and understand interactions among populations in a biological community. Key concepts include d) symbiotic relationships.
Related SOL	LS.5	The student will investigate and understand the basic physical and chemical processes of photosynthesis and its importance to plant and animal life. Key concepts include a) energy transfer between sunlight and chlorophyll.

Background Information

Lichens are an easily found but often overlooked example of symbiosis that can be readily studied in the classroom. Lichens demonstrate the mutual relationship of fungi and algae or fungi and cyanobacteria. The algae carry out photosynthesis, while the fungi absorb and hold water and nutrients and provide a place for the algae to live. Other easily found fungal symbioses are the mychorrhizal associations between fungi and the roots of plants. The study of lichens can be extended into comparing species by taking samples from various sites and doing an assortment of related field activities.

Lichens are an example of symbiotic mutualism which is one of the four main types of symbiotic relationships; the other three types are parasitism, commensalism, and predation. Students need to be able to distinguish between these four types of relationships and determine which organisms are benefiting or being harmed in the relationship.

Materials

- Samples of lichens collected from rocks or tree bark (If lichens are available in the school yard, students can collect their own lichens to study; only a small amount is necessary.) *CAUTION: If students have a mold/fungus allergy, have prepared slides available for use in this activity.*
- Microscopes
- Slides
- Cover slips
- Droppers
- Water
- Tweezers
- Copies of attached Student Activity Sheet
- Internet resources (approved by teacher)
- Library resources on symbiotic relationships

Vocabulary

chlorophyll, commensalism, mutualism, parasitism, photosynthesis, predation, sunlight

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Students should have a clear understanding of the different types of relationship between organisms. This lesson will reinforce and differentiate between the four types of symbiosis.
Intro: Fungal Friends—Lichens

1. Review the needs of plants and the needs of fungi and how they live. Review the classifications of algae and fungi. Ask students to brainstorm ways fungi and plants could work together. Introduce the lichen as an example of symbiosis. Point out that the plant helps the fungi meet their needs and vice versa. (Care should be taken not to confuse students with the fact that algae are no longer classified as plants.)
2. Place students into heterogeneous lab groups. Distribute lab supplies, and have teams perform the following steps:
3. Place a drop of water on a microscope slide.
4. Using tweezers, tease apart a small piece of lichen into the drop of water. Add a cover slip.
5. Observe the slide under the microscope. The green algal cells can be seen in the filaments of the fungi.
6. Make a field view sketch of the algae and fungi. Describe how they appear.
7. Use print or online field guides to identify the lichens.
8. Compare and contrast samples of the different lichens studied.

Investigating Symbiotic Relationships

1. Students in the classroom will become detectives with the assignment to find as many types of symbiotic relationships as possible. Assign each group a specific type of symbiosis. Have the groups *develop* a written checklist to evaluate relationships and verify that organisms meet the specific criteria. Provide students with approved Internet and library resources, and encourage them to think about organisms they encounter in everyday life. Have each group present their checklist to the class for approval and verify that each encountered symbiotic relationship does indeed fit into the classification correctly.

Assessment

- **Questions**
  - How can you differentiate between the four types of symbiotic relationships: mutualism, parasitism, commensalism and predation?
  - Which organism allows photosynthesis to take place in lichen: the fungi or the algae? What materials will this provide for the other organism?
- **Journal/Writing Prompts**
  - Describe the role of lichen in a food web.
  - Choose one of the symbiotic relationships your group identified. Explain in detail how the two organisms interact and why this relationship is important for other members of the community.

Extensions and Connections (for all students)

- As students are presenting information to the class, have each student create their own list of the relationships marking which organisms benefit (+), are harmed (-), or are unaffected (0) by the relationship.
- Have students create WANTED posters as part of their class presentation. These could be displayed in the classroom as a reminder of the activity throughout the year.
- For a literature connection, share with students *What's Eating You?: Parasites—the Inside Story,* by Nicola Davies.

Strategies for Differentiation

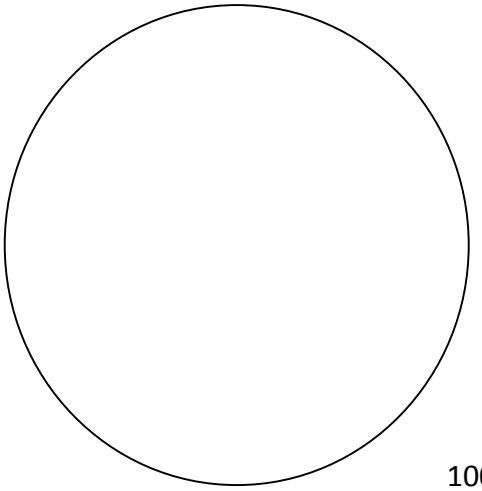
- Provide a teacher-created checklist for each type of symbiosis.
- Have examples of WANTED posters available to demonstrate requirement.
- Research the concept of coevolution, for example how the shape of flowers has evolved to fit insects required for symbiosis.

Student Activity Sheet

Name: _____ **Date:** _____

Source of Lichen 1: _____

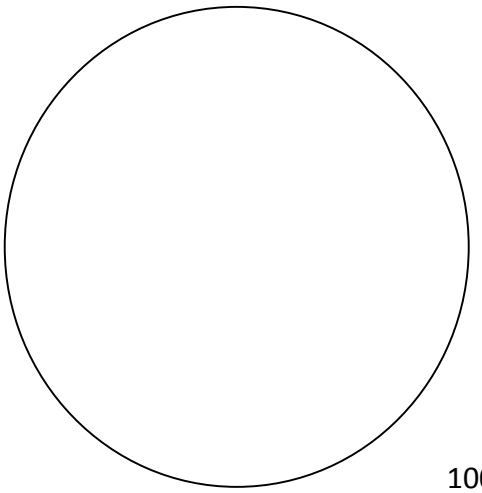
Field View **Description**



100 × _____

Source of Lichen 2: _____

Field View **Description**



100 × _____

Conclusion

Describe and name the relationship between the algae and the fungi in the lichens.