
Likeable Lichens



Purpose:

- The purpose of this lesson is to allow students to use math to explore lichens. Students will learn about the symbiotic partnership that forms a lichen before calculating the density of lichens on a found object.

Objectives:

- Students will summarize the symbiotic roles of the photobiont and mycobiont in a lichen after playing a lichen version of “Nature says.”
- Students will measure the area of one face of a lichen-covered object by separating the shape of the object into constituent quadrilaterals or circles and using area formulas.
- Students will calculate the density of the lichen population on their object by dividing the number of lichens by the area of the object.

Time Required: 1 hour

Appropriate grades: 5th-8th

NGSS and Common Core Standards:

MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

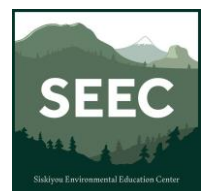
CCSS.MATH.CONTENT.6.G.A.1: Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Materials:

- 8 Lichen specimens (provided)
- Common Lichens of the Rogue Valley PowerPoint - located on kit flash drive (provided)
- Paper (not provided)
- Rulers (not provided)

Activity:

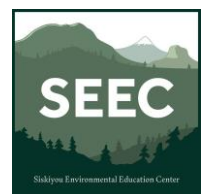
Introduction	Set out lichen specimens for students to look at. Have students observe them closely, and ask them what they think they might be. Compile a list of ideas on
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	<p>the board.</p> <p>Explain that students are looking at lichens – a composite organism created by a fungus and a photosynthetic partner – green algae or cyanobacteria (sometimes both!). Scientists call the fungal partner the <i>mycobiont</i> and the photosynthetic partner the <i>photobiont</i>.</p> <p>Explain that in a lichen each partner provides something that the other needs. The mycobiont (fungus) provides a home for the photobiont (algae or cyanobacterium), which in turn provides food. You may choose to introduce the term <i>symbiosis</i>.</p>
<p>Body</p>	<p>“Nature Says” game</p> <p>Have students stand up and face the teacher.</p> <p>Say “Nature says be algae.” If students aren’t sure how to act like algae, instruct them to simply soak up the sun’s rays like any photosynthesizer.</p> <p>Say “Nature says be a fungus.” If students aren’t sure how to act like a fungus, instruct them to form a mushroom-like shape with their arms.</p> <p>Say “Nature says form a lichen.” For this command, students must form pairs – one student (the mycobiont) will use their arms to form a roof over both students; the other will mime preparing food and feeding it to the other student. If there is an odd number and students cannot form pairs, they must sit down.</p> <p>Make sure that students only perform the actions when Nature says so – otherwise they must sit down.</p> <p>After playing a few rounds, ask students to summarize the roles of the photobiont and mycobiont in a lichen – how do the partners benefit each other?</p> <p>Exploring Lichens with Math!</p> <p>Use the “Common Lichens of the Rogue Valley” PowerPoint to introduce students to the variety of lichens they might see in this area. Highlight the variety of colors and growth forms that lichens exhibit. Some lichens form crusts (<i>crustose</i>), some have leafy lobes (<i>foliose</i>) and some have branches like tiny shrubs (<i>fruticose</i>).</p> <p>Explain that lichens can grow on just about anything! In nature, we commonly find them on trees, stumps, and rocks. Sometimes different lichens grow very close together – a single twig may contain a dozen different lichens!</p> <p>Challenge students go out in nature and find a rock or twig that they think has</p>



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the densest lichen population (i.e. the most different lichens per unit of area). Have students collect this item and bring it back to the group. Once each student has collected a lichen-filled object, have them count the number of different lichens on one surface of their object (i.e. on the top of the rock, not on all sides of the rock). Students should record this number somewhere.

Next, have students outline their object on a piece of paper. Using rulers and measuring in inches, students will measure the dimensions of this shape (length, width, diameter, etc.). Students must then find the area of the shape. If the shape is highly irregular, suggest that students divide it into smaller, regular shapes. The students may also choose to use a regular shape that is very similar in size to estimate the area of their object. See examples below.



Students will then determine the number of lichens per square inch (i.e. the lichen density) of their object with the following formula:

$$\# \text{ of lichens} \div \text{area of object} = \text{lichen density} / \text{in}^2$$

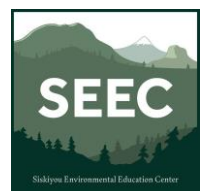
Have students share their findings with the class to determine who found the densest lichen population.

Closure

Ask students to reflect upon what we have been measuring. Discussion questions include:

- Did you know that there was so much life found on bark, rocks, and other objects?
- Where else do you think we could find lichens?
- Do you think lichens serve an important purpose in the environment?

In closing, encourage students to continue to look for lichens in their



	neighborhoods and in nature. Once you start observing lichens, you'll find that they are everywhere!
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Extension:

Have students go back out in the field and find an example of a lichen that they particularly like. Instruct students to create a detailed, scientific drawing of this lichen including the following details:

- a. Color
- b. Substrate (what is it growing on?)
- c. Size (use ruler to measure in cm)
- d. Other noteworthy characteristics

Students can use this detailed drawing to research what type of lichen they found. Using this research, students can create a presentation sharing what they learned about their lichen.

Modifications:

● Lower Elementary:

- Rather than using geometry and algebra to determine the lichens/in² on an object, have younger students simply find an object that they think has the most different kinds of lichens. Students can still compare density with each other using informal measurements (i.e. my object is smaller than yours and it has even more lichens).

● High School:

- The extension activity (scientific sketch and research of a particular lichen) provides great material for high school students. Instruct high schoolers to research what makes this lichen unique and important in the environment, including ecological roles, cultural uses, and other fun facts. Have students present these findings in a presentation to the class.

