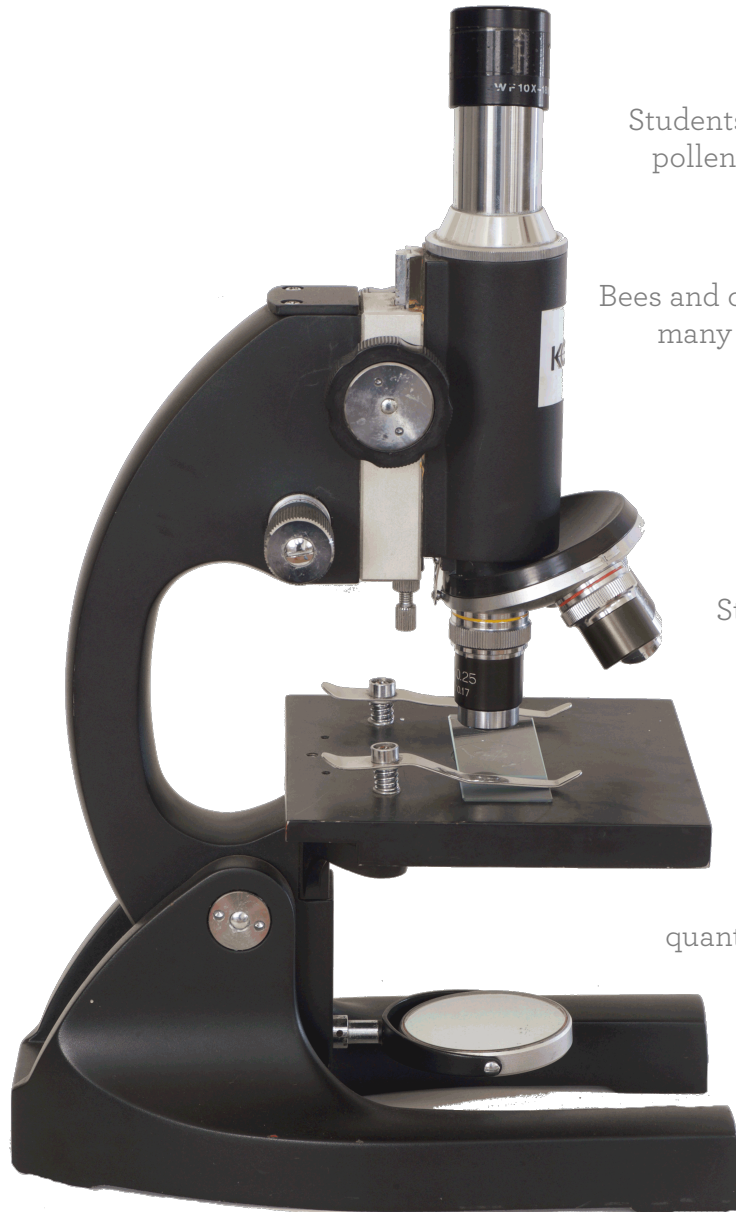


Microscope Lab



Communication

Students share equipment and collaborate in pairs to produce dry mounted slides of pollen and make inferences about structures they observe under the microscope.

Sustainability

Bees and other pollinators are interconnected with plants. Humans rely on pollinators for many of our foods and pollinators are of key importance for a healthy ecosystem.

Nourishment

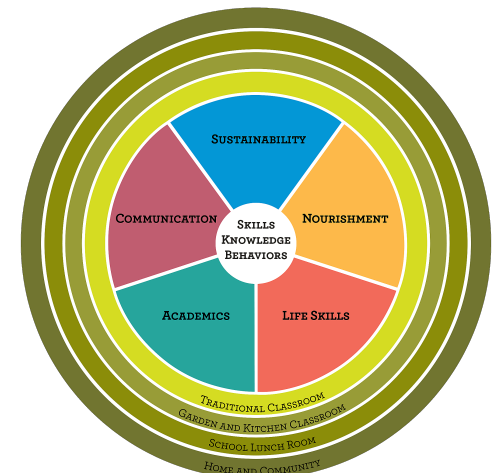
Students learn that we need pollinators for many of the foods that we eat.

Life Skills

Students focus on listening and following directions during the lab, explore the use of a microscope and use their observation skills to view enlarged pollen.

Academics

This lesson fulfills Next Generation Science Standards for interdependent relationships in Ecosystems; Common Core State Standards for following a multistep procedure; translating quantitative or technical information; integrating information; collaborative discussion; speaking and listening; language; and acquiring words and phrases.



Microscope Lab Abstract

Summary

In this 7th grade science lesson, students deepen their understanding of pollen and **pollinators** by using microscopes to observe pollen and bee species from the garden.

Objectives

After this lesson, students will be able to:

- Use a microscope to make observations
- Identify pollen as the carrier of genetic material for flowers
- Recognize bees as efficient **pollinators**

Assessments

During this lesson, students will:

- Successfully prepare a dry mount slide to observe pollen
- Correctly draw and label pollen on the **anther**
- Observe pollen-catching adaptations in bee anatomy

Communication is strengthened by sharing equipment and collaborating in pairs to produce dry mounted slides of pollen and make inferences about structures observed under the microscope. **Sustainability** is highlighted by learning that bees and other **pollinators** are interconnected with plants. Humans rely on **pollinators** for many of our foods and **pollinators** are of key importance for a healthy ecosystem. **Nourishment** is acquired by understanding that we need **pollinators** for many of the foods that we eat. **Life Skills** are sharpened as students focus on listening and following directions during the lab, explore the use of a microscope and use their observation skills to view enlarged pollen.

Academics fulfill Next Generation Science Standards for interdependent relationships in Ecosystems; Common Core State Standards for following a multistep procedure; translating quantitative or technical information; integrating information; collaborative discussion; speaking and listening; language; and acquiring words and phrases. See **Connections to Academic**

Standards below for details.

Edible Schoolyard curriculum emphasizes developing community and personal stewardship, along with skills that will help students navigate different situations throughout their lives; and using **observation and awareness** to explore, investigate and be inquisitive learners in the garden.

This lesson follows the BEETLES Project's *Learning Cycle* (Invitation-> Exploration -> Concept Invention -> Application -> Reflection) and uses their *Discussion Routines* (Think-Pair-Share, Whip-Around). All are highlighted in *Green** with an asterisk for easy identification. See the documents BEETLES_Discussion_Routines.pdf and BEETLES_Learning_Cycle.pdf included in **Resources** below for more information. Games and activities from other sources are also identified in *Green*, without an asterisk.

Connections to *Academic Standards*

Next Generation Science Standards, Middle School

Disciplinary Core Ideas:

- LS2.A: Interdependent Relationships in Ecosystems
 - Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
 - 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. (MS-LS2-1)
 - Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
 - Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)

Common Core State Standards, English Language Arts and Literacy, Grade 7

- RST.7.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

- RST.7.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 7 topics, texts, and issues*, building on others' ideas and expressing their own clearly.
 - SL.7.1.b Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
 - SL.7.1.c Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
 - SL.7.1.d Acknowledge new information expressed by others and, when warranted, modify their own views.
- SL.7.2 Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
- SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.7.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 7 Language standards 1 and 3 on page 53 for specific expectations.)
- L.7.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
 - L.7.1.a Explain the function of phrases and clauses in general and their function in specific sentences.
 - L.7.1.b Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas.
 - L.7.1.c Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.*
- L.7.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.
 - L.7.3.a Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.
- L.7.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Connections to *Edible Schoolyard* Standards

Edible Schoolyard 3.0

In the Edible Schoolyard Program

- 1.0 Students work with each other and teachers to develop community and personal stewardship, along with skills that will help them navigate different situations throughout their lives.

- 1.1.1 - 1.3.12 This lesson fulfills all Edible Schoolyard Program standards, numbers 1.1.1 through 1.3.12. See *The Edible Schoolyard Berkeley Standards* for details.

In the Garden Classroom, 7th grade

- Concepts 3.3.7 Use **observation and awareness** to explore, investigate and be inquisitive learners in the garden. The garden classroom provides the opportunity for students to tap into their inherent curiosity about the natural world, observe patterns and connections and understand cause and effect.

Microscope Lab Lesson

Materials

- Microscope Observation Lab worksheet
- Microscopes
- Slides
- Cover slips
- Pipettes
- Tweezers
- **Specimens** for observation (bees and flowers with **pollen**)
- Towels
- Clipboards
- Pencils

Before You Begin

- Copy the Microscope Observation Lab worksheet to hand out
- Prepare the **specimens** for observation
- Collect all the materials, then set them up to make an observation

Timeline Overview

Total Duration: 90 minutes

1. **Invitation*** (5 minutes)
2. **Application*** (60 minutes)
3. **Concept Invention** (5 minutes)
4. **Application*** (15 minutes)
5. **Reflection*** (5 minutes)

Procedures

At the Opening Circle

1. **Invitation***: (5 minutes)

- a. Welcome students and introduce the Microscope Lab as an extension work they have completed in the classroom.
- b. Explain that all students will rotate through the lab with their working groups to practice using microscopes by observing **pollen** and bees.
- c. Ask students to define **pollen** and **pollinator**.
- d. Divide into working groups, taking the first group to the observation lab while the other groups begin their garden jobs.

In the Field

Garden Work Rotation

2. **Application***: (60 minutes)

Students think about and discuss pollination and **pollinators** while working in the garden.

- a. Each group rotates through the Microscope Lab as the other groups work in the garden.
 - i. The first group jumps to **At the Greenhouse Microscope Lab** step 3. **Concept Invention*** while the other three groups begin their garden work.
 - ii. When the first group is done with step 4. **Application** the next group starts **At the Greenhouse**, step 3.
 - iii. Eventually, the first group will finish step 4, and loop back to begin 2. **Application**, which is their Garden Work Rotation.
 - iv. It takes a total of 80 minutes of class time to get all groups through steps 2, 3 and 4.

At the Greenhouse

Microscope Lab

3. **Concept Invention***: (5 minutes)

Students learn about the lab.

- a. Have students choose a partner and a microscope station.
 - i. Each pair should have one microscope and 2 clipboards with worksheets.
- b. Explain to students that in this station each pair will use the microscope to observe **pollen** on the **anther** and observe a bee.
- c. Explain and demonstrate the following:
 - i. Use tweezers to pluck an **anther** with **pollen** from a flower and review what an **anther** is.
 - ii. Observe the **anther** and **pollen** first on a dry slide.
 - iii. Focus the microscope to observe and draw the **pollen** and **anther**.

iv. Keep slide on stage, wipe off **anther** and **pollen**, and place bee box on the slide.

4. **Application***: (15 minutes)

Students view pollen and bees through the microscope.

- a. Invite students to begin their microscope observation.
- b. Assist students with plucking out an **anther** and making a dry slide.
- c. Once students have observed and drawn the **pollen** and **anther**, assist them in observing the bee from the bee box.
- d. When observing the bee species have students look for **pollen**-catching adaptations.
- e. Have students clean off their slides and prepare their microscope station for the next group.

At the Closing Circle

5. **Reflection***: (5 minutes)

Students participate in a seasonal tasting.

Vocabulary

Pollen

Anther

Pollinator

Specimen

Coarse adjustment knob

Fine adjustment knob

Contributors

All lessons at the Edible Schoolyard Berkeley are developed in collaboration with the teachers and staff of the Edible Schoolyard and Martin Luther King Jr. Middle School.

Learning Cycle and Think-Pair-Share discussion routine © The Regents of the University of California. All materials created by BEETLESTM at The Lawrence Hall of Science.

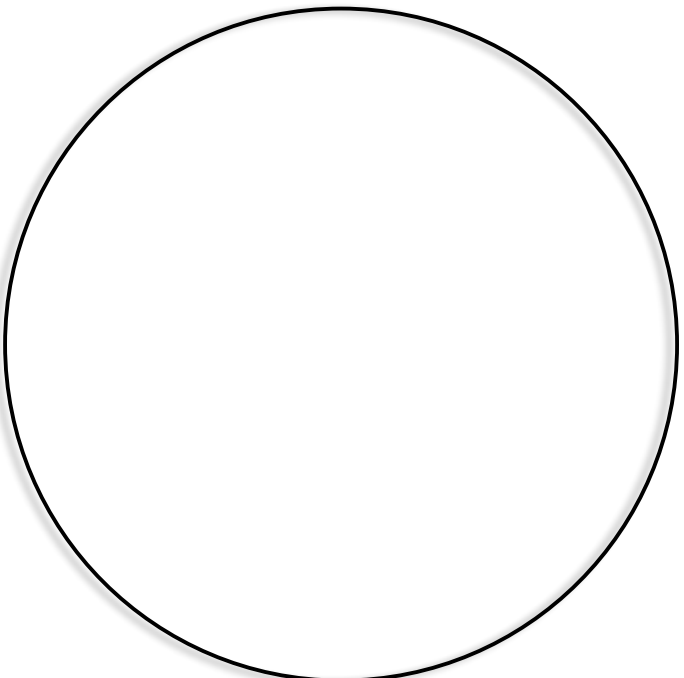
Resources

G7-3_Microscope_Observation_Lab_Worksheet.pdf

BEETLES_Learning_Cycle.pdf (See lesson G6-0)

Name: _____
Date: _____
Period: _____

Microscope Observation Lab



Sample: _____

Magnification: _____

