

BASIS Lesson Plan

Lesson Name: Cells and Microscopes!

Grade Level Connection(s)

NGSS Standards: Grade 4, Life Science (4-LS1)

FOSS CA Edition: Grade 5, Life Science: Living Systems

**Note to teachers: Detailed standards connections can be found at the end of this lesson plan.*

Teaser/Overview

Have you ever looked at small things under a microscope or wondered how plants, microbes, and small animals are connected? Get ready to dive into the world of cells and how we can see them! Students will look through a microscope at plants and animals to discover all the different shapes, sizes, and colors that cells have. Students will also make observations about what they see, discover similarities and differences between plants and animals, and take pictures of some of the slides so that they can see them projected and larger than life!

Lesson Objectives

- Students will learn what a microscope is used for, how scientists use them for research, and will learn how to use a simple microscope to look at small objects.
- Students will be introduced to the idea that all living things have a conserved structure when viewed at a small scale as they explore the different shapes, sizes, and colors of cells.
- Students will understand that organisms and living systems are made up of cells and that microscopes allow us to observe the world at a much smaller scale.

Vocabulary Words

- **Microscope:** a scientific tool used to look at things very close up
- **Organism:** a living thing (e.g. plant, animal, fungi, bacteria)
- **Cell:** the smallest unit of a living thing; all organisms are made up of cells
- **Tissue:** a collection of the same type of cell (e.g. muscle)
- **Single-celled:** a living thing that is made up of only one cell
- **Multicellular:** a living thing that is made up of many cells

Materials

Scientist Volunteers will bring:

- Presentation to introduce microscopes & the micro world
- Magnifying lens (1)
- Flashlight (1)
- Microscopes with phone attachments (6-8)
- Pre-made microscope slides (8 sets of 10 slides each)
- Worksheets (32 copies)

Materials teachers should provide:

- Pens/pencils

Classroom Set-Up

We will need a projector to hook up to a computer for our introductory slideshow. We will have “stations” consisting of a table or couple of desks pushed together, each with 4-6 students seated around it. The exact number of groups will depend on the number of volunteers for the presentation because each group will be led by one or two volunteers. The topic introduction will start with a PowerPoint presentation, so we will need access to a projector. The students will then work with a presenter through a set of slides and answer questions on a worksheet. At the end of the lesson, students will share some of the things they learned by looking at samples under a microscope. Nametags for students are always helpful.

Classroom Visit

1. Introduction (15 minutes)

Role Model Introduction:

Being a role model is an important part of being a BASIS volunteer! Begin your lesson by explaining who you are and what you do as a scientist. Feel free to tell your “story” as if giving an elevator pitch to elementary school students: Why did you become a scientist? What questions are you trying to figure out? What do you do in your job? Why should students relate to you? Feel free to bring in photos, specimens, and other props. Let your personality shine through!

Topic Introduction:

After you introduce yourselves as role models, take some time to introduce the topic of this lesson: *cells and microscopes*. It may be helpful to keep the suggested take-away in the back of



your mind throughout the lesson: **Microscopes allow us to view the world at a smaller scale, helping us understand that although cells have different colors, shapes, and sizes, there are also conserved structures between them.**

Your topic introduction should introduce students to the phenomena they will explore. As much as possible, try to frame this information as questions posed to the class, rather than as a lecture. This helps activate students' prior knowledge and facilitates student-guided conversation. The phenomenon of this lesson will be introduced through an interactive slideshow.

- Ask students to look at images that were taken with a microscope and to try and match them to macroscopic objects. Is this easy or hard to do? Do things look similar or different? Things can look very different at the micro scale!
- What are some devices or tools that can help us when we want to view objects that are very small or very far away? [**microscope**, magnifying glass, telescope, binoculars]
- What do all of these objects have in common? [Glass lens; Use light]
- All of these devices use glass lenses and those lenses are able to bend light passing through them. A convex lens is able to focus the light to make images appear larger or closer than they actually are.
- We will demonstrate this concept in the classroom using a magnifying glass and flashlight to observe how the lens can focus the light and create a tiny spot of light.
- Ask students to observe additional images taken with **microscopes**, showing in particular some objects and organisms that are only viewable using very powerful microscopes. In particular, volunteer presenters will highlight some images from their own research and studies.
- Now that we know microscopes can help us to see very small objects, what do you think is the smallest part of a living thing that we could see? Do you think we could see the leg of a fly? What about a single toe on that leg? What about a single hair? Smaller? Let's find out!
- We will then demonstrate how to use the microscopes and our expectations for student participation during the lesson: asking questions, following along and filling out the worksheet, being respectful to the presenters, being respectful of the equipment, and sharing their ideas and materials with their classmates.

2. Learning Experience (35 minutes)

Students will now be divided into groups of 4-6 students, depending on how many volunteer presenters are in the classroom. Remember that all activities are designed to address the take-away in a particular way: **Microscopes allow us to view the world at a smaller scale, helping us understand that although cells have different colors, shapes, and sizes, there are also conserved structures between them.**

- Each group will have the opportunity to use one microscope with the help of the volunteer presenter. These microscopes have a screen to allow students to see the slide sample at the same time and also enables the presenter to point out particular structures.
- Explain the microscope set-up that will be used for observing the prepared slides. Each presenter will have a set of prepared slides that showcase plant and animal tissues and organs.
- Pass out a worksheet to each student. Students should make observations and record these on their provided worksheet. There will be guiding questions for each slide mount that students will need to answer on their worksheet. Students will observe each slide and describe or draw what they see. Students should predict features that may become visible when using microscopes that cannot be seen without magnification.
- Start with the largest objects and then zoom in further and further, in terms of scale.
 - Students will observe details of insects – including the hairs on their legs.
 - Students will observe plant vascular structures.
 - Students will observe **cells** arranged in a **tissue**. [Define for students]
 - Students will observe a **single-celled organism**. [Define for students]
 - Students will also observe other features of plants and animals that can only be seen under magnification.
- Guide student observations, making sure they are paying attention to the similarities and differences between each slide. Ask students to compare and contrast different parts of an animal or plant macroscopically. Then have them make comparisons and contrasts to animals and plants at the microscopic level.
- If time allows, students will also have the chance to observe classroom objects of their choice under the microscope. Continue to guide this student exploration and have them make recordings of these observations on their worksheet.

3. Wrap Up: Review and Discuss the Learning Experience (5 minutes)

This is the “discussion and conclusions” part of the lesson. Groups of students will share what they learned with the rest of the class.

- What are living things made up of?
- What is a microscope and how does it work?
- What are the similarities between different types of cells?
- What are the main differences between plant and animal cells?
- What are some other things we could look at under the microscope?
- Invite observations and questions

4. Connections & Close (5 minutes)

Connections to the real world around students:

- Why is it important to understand the structure of cells?
- How does this structure help us to understand function?
- If we need to develop medicines that reach cells in our body, how could microscopes help us?

- Volunteer presenters will make other connections to their research and the importance of microscopes in their work.

Close:

Wrap up as a role model by leaving a few minutes for students to ask questions about science, about being a scientist, and about becoming a scientist. Then, thanks and goodbye!

Follow Up: After the Presentation

Teachers who wish to extend the impact of this lesson may find the following CRS web pages useful:

- <http://www.crscience.org/educators/helpfulreports>
- <http://www.crscience.org/educators/treasuretrove>

Build your own cell-phone microscope. These are the same microscopes the BASIS team uses in this lesson. Follow these instructions to make your own for use at home or in the classroom.

<http://www.instructables.com/id/10-Smartphone-to-digital-microscope-conversion/>

Literacy/Reading Connections:

Have the students write a letter to the scientists explaining what they learned about cells and/or microscopes. Send letters to: Community Resources for Science, 1611 San Pablo Ave Ste. 10B, Berkeley, CA 94702

Cells Are Us, by Fran, Dr. Balkwill, Mic Rolph – “This is a book about the various types of cells that make up the human body. By using lively and expressive language, and by portraying the different cells with colorful and imaginative drawings, the author and artist teach the reader how an individual person is created from just one cell.” <http://www.amazon.com/Cells-Are-Us-Frances-Balkwill/dp/0001963066>

Science Concepts: Cells, by Alvin and Virginia Silverstein and Laura Silverstein Nunn- “The book explains cell structure and function, cell division and reproduction, cell specialization, cloning, stem cell research, and cell fusion.”

<http://www.nsta.org/recommends/ViewProduct.aspx?ProductID=13611>

Videos:

The Wacky History of Cell Theory <http://ed.ted.com/lessons/the-wacky-history-of-cell-theory>

Scientific discovery isn't as simple as one good experiment. The weird and wonderful history of cell theory illuminates the twists and turns that came together to build the foundations of biology.

Cells by Discovery Channel Schools

<http://www.nsta.org/recommends/ViewProduct.aspx?ProductID=13000>

**CRS**

WWW.CRSCIENCE.ORG

COMMUNITY RESOURCES FOR SCIENCE

Standards Connections

NGSS:

- Connections by topic
Life Science: 4. Structure and Function.
- Connections by disciplinary core ideas:
Life Science: 4-LS1 From Molecules to Organisms: Structure and Processes
- Connections by scientific & engineering practices
6. Constructing explanations and designing solutions
8. Obtaining, evaluating, and communicating information
- Connections by crosscutting concepts
3. Scale, proportion, and quantity
6. Structure and function
- Connections by performance expectation:
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

FOSS CA Edition kit: Grade 5 Life Science: Module 3, Sugar and Cells