



**Fifth Grade Instructional Segment**

**Student Science Performance**

**Grade - 5th**

**Title:**

**Topic - Life Science: Plant and Animal Cells**

How Small is a Cell?

**Performance Expectations (Standard):**

**S5L3. Obtain, evaluate, and communicate information to compare and contrast the parts of plant and animal cells.**

- a. Gather evidence by utilizing technology tools to support a claim that plants and animals are comprised of cells too small to be seen without magnification.
- b. Develop a model to identify and label parts of a plant cell (membrane, wall, cytoplasm, nucleus, chloroplasts) and of an animal cell (membrane, cytoplasm, and nucleus).
- c. Construct an explanation that differentiates between the structure of plant and animal cells.

**S5L4. Obtain, evaluate, and communicate information about how microorganisms benefit or harm larger organisms.**

*(Clarification statement: Possible microorganisms could include Tardigrades, Lactobacillus, Probiotics, Rotifers, Salmonella, Clostridium botulinum (Botox), E-coli, Algae, etc. Students are not expected to know these specific microorganisms. The list is provided to give teachers examples.)*

- a. Construct an argument using scientific evidence to support a claim that some microorganisms are beneficial.
- b. Construct an argument using scientific evidence to support a claim that some microorganisms are harmful.

**Lesson Performance Expectations:**

- Use technology tools to gather evidence that plants and animals are comprised of cells.
- Observe plant cells using magnification to see parts of the cell: wall, cytoplasm, chloroplasts, and nucleus.
- Observe animal cells using magnification to see that the animal cell does not have a wall or chloroplasts, but does have a membrane, cytoplasm, and nucleus.
- Construct an explanation for decomposition and argue from evidence whether decomposition is harmful or beneficial.
- Construct an argument to support evidence that microorganisms are present though usually invisible to the naked eye.

Additional supports for struggling students

**Lesson Logistics/Materials:**

Small pieces of fruit or vegetables for observation  
 Microscopes and prepared slides  
 Materials for preparing slides such as droppers, water, stain, onion skin, etc.  
 Science Journals

**Student Science Performance**

**Engaging Learners**

**Phenomenon:**

Fruit, a multi-celled organism, is broken down through microorganisms over time. This decomposition takes several days and can be observed through the following YouTube video.

[Time lapse video of decomposition](#)

Prompts for writing or discussion:

- Describe the fruit at the beginning of the video.

- Describe the fruit at the end of the video.
- What is the same?
- What is different?
- Does it seem that some of the fruit in the video simply disappeared?
- What questions do you have about what you observed?

Students will make a claim concerning decomposition and whether it is harmful or beneficial. They will conduct research citing sources to enhance their reasoning that supports or disputes their claim.

[CER Worksheet](#)

*Teacher Notes: Explain that the changes in the fruit took place over several days. Explain that there were millions of organisms in the video, but that students were not able to see them due to their size. Ask students to make a connection to previous understandings of matter to determine if the fruit simply disappeared. Explain that there is an “invisible system at work.”*

### **Evaluating**

Students describe the fruit at each stage in the video. Students should draw a before and after picture of the basket of fruit. Ask students to hypothesize what type of system could be at work in the video.

*Prompts for Writing or Discussion:*

- *What is a system?*
- *Can you name any types of systems?*
- *What caused the fruit to change in the way it did? Are the plants being broken down into smaller parts?*

Students construct an explanation for the changes in the fruit, based on what they observed in the video, the information provided from the teacher, and hypothesis of the “invisible system.”

*Prompts for Writing or Discussion:*

- *Why do you think it took several days for the fruit to change?*
- *What could fruit be composed of that would be considered a system?*
- *Are there different structures within the plants that we cannot see?*

### **Communicating:**

Students develop a model to illustrate their explanations for the decomposing fruit and the possible smaller structures contained therein.

*Prompts for writing or discussion:*

- *How do you know that there is a system involved in this phenomenon?*
- *Why can't you see what is causing the fruit to change?*
- *Are there pieces of the fruit that remain, but are too small to see with the unaided eye?*
- *How did something grow out of the decaying fruit?*

## Exploring

**Phenomenon:** *Students will observe plant cells with a hand lens and a microscope to observe that multicellular organisms contain many structures and functions and are part of system.*

This is a 6-minute video explaining how to make a plant cell slide out of onion skin.  
[Making an onion skin slide](#)

### **Obtaining**

If microscopes are available:

Choose types of plant cells and animal cells for viewing under the microscope. Use a very thin piece of covering from a leaf or vegetable, like an onion skin. Use care if making an animal cell slide out of a smear of fresh beef, chicken or pork. Wash materials and hands after touching these slides. It is safer to use prepared slides obtained commercially or from a local high school biology class.

If possible, have students look at larger sections with a hand lens. Students obtain information about cells, as parts of an organism by viewing them under the microscope and through a hand lens. Have them sketch what they see and determine if they can distinguish parts to label in their sketch. There are no chloroplasts in onion skin because it is not green, but students will view the box like cell wall and the space filled with cytoplasm. The dot found inside the box is the nucleus. Have students sketch what they see and label parts.

### **Evaluating**

Students revise their previous explanations for what happens as plants break down into smaller pieces based on what they have viewed under the microscope.

*Prompts for Writing or Discussion:*

- *Are there parts in the smaller pieces of the plants you observed?*
- *How did the parts differ when viewing them from a hand lens and under the microscope?*
- *How do the parts work together to form a system?*
- *How do these parts work together to keep a plant healthy?*
- *What happens to these parts as a plant starts to break down/decompose?*

### **Communicating**

Students revise their model to include the structures they have viewed and explain how these structures are part of the larger system in which the plants decomposed.

*Prompts for Writing or Discussion:*

- *Based on your observations, are plants made of many different structures?*
- *Why did you need a microscope to view the smallest structures within the plant?*
- *What has changed in your model based on your observations?*
- *How does adding in the smaller structure change your model of the system?*
- *Are there parts of the system that are still not evident in your model?*

<p><b>Explaining Phenomena</b></p>	<p><b>Obtaining</b>          Students are provided with the <a href="#">information about cells</a> and can take notes in their journals. This information can be organized and printed for students or put into a slide presentation.</p> <p>Questions and model to initiate class discussion:</p> <p>Are all living things made of cells? How do you know?          What is the function of the structures found in cells?          What systems are formed by cells?</p> <p>Invite someone from a health profession (nurse, doctor, etc.) to talk to the class about beneficial and harmful microorganisms and the reasons for good hand washing and cooking food correctly.</p>
	<p><b>Evaluating</b>          Plant and animal cells are part of system and contain structure too small to be seen without a microscope.</p> <p>Students revise previous explanations for the decomposition of the plants and the structures and functions they have observed.</p> <p><i>Prompts for Writing or Discussion:</i></p> <ul style="list-style-type: none"> <li>● <i>What are the structures you observed under the microscope?</i></li> <li>● <i>Do all plants have these?</i></li> <li>● <i>What are the other parts of the system that made have led to the plants in the video breaking down?</i></li> <li>● <i>Can the components within the system function alone?</i></li> </ul> <p><b>Communicating:</b>          Students should revise their previous models to include the new information about cells and explain how the structures are part of the larger system in which the plants decomposed.</p> <p><i>Prompts for Writing or Discussion:</i></p> <ul style="list-style-type: none"> <li>● <i>Based on your observations, are plants made of many different structures?</i></li> <li>● <i>Why did you need magnification to view the smallest structures within the plant?</i></li> <li>● <i>What has changed in your model based on your observations?</i></li> <li>● <i>How does adding in the smaller structure change your model of the system? A</i></li> <li>● <i>re there parts of the system that are still not evident in your model?</i></li> </ul>
<p><b>Assessment of Student Learning</b> includes student questions, quizzes, labeled drawings, and writing.</p>	
<p><b>Elaborating</b></p>	<p><b>Phenomenon:</b> <i>Plants and animals have cells with structures that are part of a larger system.</i></p> <p><b>Activity 1</b>  <b>Obtaining</b></p>

Students obtain information about other foods decomposing. There are videos and information available through student research.  
Students identify that meat/animal products break down over times as well.  
Students obtain knowledge from viewing an animal cell under the microscope. They can make an animal slide using tiny bits of cooked chicken or beef.

Students will notice that there is no cell wall defining the cells, but there is a space of cytoplasm. Depending on the clarity of the slide, students may find the nucleus. Have them sketch what they see and label any parts they find.

### ***Evaluating***

Students compare the structures they viewed from the plant cell and animal cell.

Students use their model as evidence to construct an argument that all living things are made of cells and part of a system with many parts.

Students can hypothesize what caused both types of organisms to decompose.

### ***Prompts for Writing or Discussion:***

- *How are plants and animals structurally similar?*
- *Do they have the same structures and functions?*
- *Are plants and animals part of the same system?*
- *How did they break down differently? Similarly?*

### ***Communicating***

Students write a brief summary comparing and contrasting plant and animal cells, providing specific examples of the organisms that fall into those categories. Additionally, they can offer their explanations for the decomposition of the organisms observed in this lesson, providing a bridge to further lessons about microorganisms.

### ***Activity 2***

#### ***Obtaining:***

After watching the video, have each student write what they now know about what they observed. Put them in small groups to discuss and combine or choose items to write on sticky notes of what they know and post them on a class chart labeled "Claims." These are the things they claim they know.

#### ***Evaluating:***

Have the group then look at the class' sticky notes and choose two items to research. Students should then decide if decomposition is a harmful thing or a beneficial thing. Using a different color of sticky note, have them write the research evidence of why this is harmful or beneficial. Look for research about the harm of decay raising the cost of produce and food and the benefits of composting.

#### ***Communicating:***

Add a second and third column to the class chart: Evidence for and Evidence against. Have all the students who think decomposition by microorganisms is harmful come up with their reasoning why this is so based on their research. Have all the students who think



	<p>decomposition is beneficial, discuss their reasoning based on their research. This is arguing from evidence. They can write their reasoning, discuss their reasoning, or decide to do more research to find ways to protect against decay or begin a compost spot.</p> <p><i>If possible, have experts come speak to the class: grocers, gardeners, 4-H extension agents, etc. There are various videos and resources that demonstrate the harmful and beneficial nature of microorganisms.</i></p> <p>Have students do the same thing for some of the other microorganisms listed in the clarification statement. Have students research other microorganisms and determine if they are harmful to humans, beneficial, or both depending on how it is used.</p> <p>Challenge students to go on a microorganism scavenger hunt to look at labels for cultures of microorganisms in yogurt, probiotics, buttermilk, yeast bread, cheese, etc.</p>
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<p><b>Assessment of Student Learning</b>          Ask students to make posters about why clean hands and properly cooked foods are necessary for good health. Have them include information about harmful microorganisms. Allow them to post their work around the school to alert other students about the benefits of keeping clean.</p>	
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<p><b>Evaluating Learners</b></p>	<p style="text-align: center;"><b>Student Science Performance</b></p> <p><b>Students will create analogies regarding the relationship of an organism and its functioning parts.</b></p> <p><b>Obtaining:</b> Think about the way a body system works. We need a brain to direct energy and motion, a transport system to pump blood and spread nutrients around the body, a system for energy, we need water. Now think about a cell and all of specialized structures that support life.</p> <p><b>Communicating:</b> Produce a model (analogy) of a nonliving system (bicycle, restaurant, city government, store, etc.) to demonstrate how the structure of and function of a cell work together.</p> <p>The cell is like a _____. The nucleus is like the _____ since it is the control. The cytoplasm is like the _____, because _____.</p> <p>The cell membrane is like the _____, because it _____.</p> <p>In a plant cell the cell wall is like the _____, because it _____.</p> <p>In a plant cell the chloroplasts are like the _____, because they _____.</p>
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<p><b>Assessment of Student Learning</b>          The following CER template/rubric may be used to evaluate student’s task performance: <a href="#">Claim, Evidence, Reasoning</a></p>	
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<p><i>SEP, CCC, DCI Featured in Lesson</i></p>	<p style="text-align: center;"><b>Science Essentials</b></p>
<p><b>Science Practices</b></p>	<ul style="list-style-type: none"> <li>● Constructing explanations and designing solutions</li> <li>● Engaging in argument from evidence</li> <li>● Developing and using models</li> <li>● Obtaining, evaluating, and communicating information</li> </ul>



<b>Crosscutting Concepts</b>	<ul style="list-style-type: none"><li>● Systems and System Models</li><li>● Scale, Proportion, and Quantity</li><li>● Stability and Change</li></ul>
<b>Disciplinary Core Ideas</b>	From <a href="#">A Framework for K-12 Science Education</a> : <ul style="list-style-type: none"><li>● LS1.A: Structure and Function</li><li>● LS1.C: Organization for Matter and Energy Flow in Organisms</li><li>● LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</li><li>● LS3.A: Inheritance of Traits</li><li>● LS3.B: Variation of Traits</li></ul>



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**Additional Supports for struggling learners:**

**The following supports are suggestions for this lesson and are not the only options to support students in the classroom. These supports target students that struggle with science material, this lesson or a previous lesson. These are generalized supports and do not take the place of IEP accommodations as required by each student’s Individualized Education Program.**

**General supports for the following categories:**

<u>Reading:</u>	<u>Writing:</u>	<u>Math:</u>
<ol style="list-style-type: none"> <li>1. Provide reading support by reading aloud</li> <li>2. Have the teacher model what they are thinking when reading the text</li> <li>3. Annotate the text with students so that they may refer to it as they work through the lab</li> </ol>	<ol style="list-style-type: none"> <li>1. The teacher can provide a sentence starter for the students.</li> <li>2. The teacher can give students an audience to write to (i.e. Write a letter to your sibling explaining this topic).</li> <li>3. The teacher can provide constructive feedback during the writing process to help students understand the expectations.</li> </ol>	<ol style="list-style-type: none"> <li>1. Sheets of paper with boxes that show progression of time could be given to students to allow them to accurately record what is happening as the fruit decomposes.</li> </ol>

**Supports for this specific lesson if needed:**

**Performance expectations for instruction:**

1. The teacher should have a clear plan on how to assess student learning. The teacher can provide a rubric to help students self-monitor their learning as they move through the unit.
2. The teacher should provide multiple formats that allow the students to express their knowledge.

**Engagement:**

1. The teacher may need to show the video more than once to ensure that students are able to identify the most important concepts.
2. Also, the teacher can provide a sheet to the students with a series of boxes that follow the time progression of the video. The students can use this to draw the progression of the fruit decomposition as they see it in the video. This may allow students to more easily see that the change happens over a period of time rather than all at once.
3. The teacher could also put a fruit bowl on the desk and see the decomposition happen in real time over the course of the lesson to reinforce the time. If the teacher chooses to do this then it would be a good idea to put it out of reach of students, in a container that has a mostly complete seal and throw it away before the decomposition gets too advanced.
4. The teacher should provide discussion questions to struggling students in advance. This will allow students to formulate answers in advance and feel more prepared when the discussion happens in class.
5. The teacher should allow the students to express their knowledge in various formats. These formats could include drawing images, making a cartoon, creating a power point slide or

writing an answer.

6. Struggling students may require additional time to complete the model portion of this lesson.

**Exploring:**

1. The teacher may need to show the video more than once to ensure that students are able to identify the most important concepts.
2. Struggling students may require a sheet with tiles to record their sketching of the cell as they observe it.
3. The teacher can, also, provide a word bank to help students label the cells after they observe the specimens.
4. The students may require additional time to revise their explanations or models.
5. The teacher should provide discussion questions to struggling students in advance. This will allow students to formulate answers in advance and feel more prepared when the discussion happens in class.

**Explaining:**

1. Struggling readers and those students with processing disorders may struggle with putting written information into context. The teacher should have an alternative format to present these facts, such as a video, a slide presentation with pictures or a song that contains the facts. This will give struggling students multiple ways to integrate the content into their knowledge base.
2. The teacher should provide discussion questions to struggling students in advance. This will allow students to formulate answers in advance and feel more prepared when the discussion happens in class.
3. The teacher should prepare students that struggle with change for the visits of professionals into the classroom.
4. Struggling students may require additional time to revise their expectations.
5. The teacher should be sure to formatively assess students and re-teach/review as needed throughout this lesson.

**Elaborating:**

1. Students may find activity 1's research to be open ended and difficult. The teacher should have a prepared list of questions and sources for struggling students to use if needed.
2. After the students have all had a chance to look at the cells and sketch what they noticed the teacher should put an image of what they should have seen on the board. This way all the students can see the images even if, for some reason, they did not see it under the microscope.
3. The teacher should provide discussion questions to struggling students in advance. This will allow students to formulate answers in advance and feel more prepared when the discussion happens in class.
4. The teacher should allow the students to express their knowledge in various formats. These formats could include drawing images, making a cartoon, creating a power point slide or writing an answer.
5. The teacher may need to show the video more than once to ensure that students are able to identify the most important concepts.
6. In activity 2 the students are asked to make claims. The teacher can provide sentence starters to help students begin their claims. This will cut down on anxiety That some students face when staring at a blank box on a page.
7. The teacher should be sure to record the two questions that the students want to research in a prominent place on the board.
8. It may be beneficial to struggling students to give a set of sources that they can use to find

answers to the questions that they are researching.

9. When students are using their research to defend or refute their claim, the teacher, should have clear rules that protect students' feelings as they participate. Also, be sure to include everyone.
10. Be sure to prepare students for any visitors that are coming to the classroom. This will assist students that struggle with change.
11. The teacher should allow the students to express their knowledge in various formats. These formats could include drawing images, making a cartoon, creating a power point slide or writing an answer.

**Evaluating:**

1. Analogies are very abstract concepts to struggling students. So, the teacher should allow the students to express their knowledge in various formats. These formats could include drawing images, making a cartoon, creating a power point slide or writing an answer.
2. Students may need additional time to construct their final product.



**Claim—Evidence—Reasoning** Name: \_\_\_\_\_

Do you think decomposition is caused by something too small for us to see?

Claim:

Evidence: Research decomposition so you will have evidence for your reasoning. Be sure to cite your evidence and include the source.

Reasoning: Write how or why your evidence supports or disputes your claim.

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## Information About Cells

### Today we are focusing on cells.

- Cells are the basic unit of structure and function in all living things.
- They are basically the building blocks of everything that breathes, moves and reproduces on Earth.

### Look at your hands.

- What do you see? You might see skin, nails, lines and maybe even a little dirt!
- What you don't see is that there are other organisms living on your hands....and the rest of your body. They are not even paying rent!
- Most of these organisms are single-celled organisms, like bacteria.
- Single-celled organisms do everything necessary to survive within 1 cell.

### Can you see the cells in your hands?

- Nope!
- What do you think the cells in your hands are called?
- They have several different names.
- Skin cells, bone cells, blood cells...just to name a few.

### **Why so many cells?**

- Humans along with most other living organisms, except for microorganisms are **multi-celled organisms**.
- This means that we have many different types of cells performing specific functions inside of our bodies.
- We have about 310,785,632,495 cells in our bodies.

### **Cells have specific functions.**

- Each different type of cell has a specific function or job.
- Cells exist in a hierarchy.
- A group of cells working together forms a tissue, such as the lining of your stomach.
- Tissues working together form an organ, such as your stomach.
- Organs working together form an organ system, such as your digestive system.
- A group of organ systems working together forms an organism, like us!

### **Your turn...**

- Based on what you know about the human body, what other types of cells and tissues can you name? (Think about the organs and organ systems that you know.)
- Do you have any revisions to make to your model based on the new information?
- Can you describe how cells are part of a system?
- Have you figured out what caused the plants in the video to change?



## EVIDENCE-BASED CLAIMS: CER for Scientific Explanations

	<b>Claim</b>	<b>Evidence</b>	<b>Reasoning</b>
<b>Facts and Ideas</b>	I have researched a topic and can accurately share my point of view.	I have examples to illustrate my claim. I have a vivid description, so my audience can ‘see’ what I am thinking. I have found details, statistics, dates, and facts that are important and related to the question or problem.	In conclusion, I share my interpretation of events. My audience knows why I have chosen this claim.
<b>Words and Organization</b>	I use vocabulary related to my research and the standard. I use strong, clear language. I have chosen an effective way to organize my claim so that my meaning is clear.	I have chosen to represent my claim through a sequence of events, a compare and contrast format, a cause and effect pattern, or an explanation of evidence.	I have used evidence to support my claim. It is clear to my audience why I chose these specific examples to explain my claim.
<b>Opinions and Point of View</b>	My tone is informative, and my audience knows what I am thinking.	My language, labels, and words are clear, so my audience knows the difference between fact and opinion.	I have offered my explanation, my idea, my answer, and supported my claim with a personal reflection based on evidence.
<b>Score:</b>	Level 1: Developing 1-3 Level 2: Proficient 4-6 Level 3: Skilled 7-8 Level 4: Exceptional 9-10	Level 1: Developing 1-3 Level 2: Proficient 4-6 Level 3: Skilled 7-8 Level 4: Exceptional 9-10	Level 1: Developing 1-3 Level 2: Proficient 4-6 Level 3: Skilled 7-8 Level 4: Exceptional 9-10
<b>TOTAL SCORE</b>  _____ points out of 24. (scores over 24 receive a 100)	Claim: ____ out of 10	Evidence: ____ out of 10	Reasoning: ____ out of 10

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