

Engaging Students in 3-Dimensional Science Investigations using a Gather, Reason, Communicate (GRC) Lesson-MS



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Welcome!





- Name
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- How did you hear about this PD?



Webinar Resource Dashboard

Facilitator: Pohoss	a Carolli I Pabassa Carolli@arad gov
ADE Science Standards Page ADE	Science Resource Page ADE Science & STEM Webinars
General Resources	 Presentation PDF: <u>PDF of Slides</u> <u>Books- Investigating Using GRC and Teaching Science is</u> <u>Phenomenal</u> <u>5 Different Species of Leaves Images & Video</u>
3 Categories of Science & Engineering Practices	 Assessing Practices Along a Continuum Article from NSTA The Wonder of Science 3-D Cards
Going 3D with GRC Lesson Website and Resources	#Going 3D w/GRC Main Website
Comparing AzSS vs. NGSS Planning Summaries	<u>K-12 Planning Summaries</u>
Middle School Lesson from #Going3Dw/GRC website	 6-8 Grade GRC Lesson Used in this Webinar- Green Leaves 6-8 GRC Lesson with Language Acquisition Strategies- Green Leaves



MAKE A FORCED COPY





Gray- means we will open and use

WHAT, HOW, WHY

- Become familiar with and experience a lesson that utilizes the Gather, Reason, Communicate (GRC) approach to sensemaking
- Explore a few digital strategies to help students to gather evidence to construct and revise explanations.
- Deepen understanding of the 3-dimensional approach to science teaching and learning & how this approach connects to the AzSS



#Going3Dw/GRC Lesson Website



Leaves

Dear Teacher of Science,

Thank you for continuing to support your students during the Covid–19 Pandemic. Below is a link to ideas on ways to engage your students as they learn from home through your thoughtful guidance.

Investigations Beyond the Classroom

Going 3D with GRC Lesson Website and Resources

#Going 3D w/GRC Main Website

- 6-8 Grade GRC Lesson Used in this Webinar- Green Leaves
- 6-8 GRC Lesson with Language Acquisition Strategies- Green



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Arizona Science Standards in Lesson

****Lessons on this website are connected to NGSS****

MS-LS1-2 Cell structure and function	Green Leaves *	HI OR	Structure and Function of Cells Photosynthesis	Phenomenon: Leaves are darker on the top as compared to the underside.	GRC PIP	The lesson includes instructional strategies for students to develop questions. Includes formative assessment
	<u>Green Leaves</u> Language Acquisition	Hilo Hi	Structure and Function of Cells Photosynthesis	Phenomenon: Leaves are darker on the top as compared to the underside.	GRC Engage Explore	The lesson is the same as the above lesson but includes Language

Main Connected Arizona Science Standard

Life Science: Students develop an understanding of the structure and function of cells.					
Arizona Science Standards- 7th Grade Life		Next Generation Science Standards- 7th Grade Life			
7.L1U1.8 Obtain, evaluate, and communicate information to provide evidence that all living things are made of cells, cells come from existing cells, and cells are the basic structural and functional unit of all living things.	Р	MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.			
7.L1U1.9 Construct an explanation to demonstrate the relationship between major cell structures and cell functions (plant and animal).	Ρ	MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.			

Bundled Standards for One Lesson

Grade: 6-8	Lesson Title			
Lesson Topic: Structure and Function of Plant Cells	Green Leaves			
Performance Expectations (Standard) from State Standards of	or NGSS:			
MS-LS1-2. Develop and use a model to describe the function of a	cell as a whole and ways the parts of cells contribute			
to the function. [Clarification Statement: Emphasis is on the cell functioning as	a whole system and the primary role of identified parts of the cell,			
specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.]	[Assessment Boundary: Assessment of organelle structure/function			
relationships is limited to the cell wall and cell membrane. Assessment of the funct whole cell. Assessment does not include the biochemical function of cells or cell par	ion of the other organelles is limited to their relationship to the ts.]			
MS-LS1-6. Construct a scientific explanation based on evidence for	or the role of photosynthesis in the cycling of matter			
and the flow of energy into and out of organisms. [Clarification State	ment: Emphasis is on tracing the movement of matter and the flow			

7.L2U1.12 Construct an explanation for how some plant cells convert light energy into food energy. 7.L1U1.9 Construct an explanation to demonstrate the relationship between major cell structures and cell functions (plant and animal).



Planning Summaries to Compare the AzSS to NGSS

Arizona Science Standards- 7th Grade Life		Next Generation Science Standards- 7th Grade Life		
7.L1U1.8 Obtain, evaluate, and communicate information to provide evidence that all living things are made of cells, cells come from existing cells, and cells are the basic structural and functional unit of all living things.	P	MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.		
7.L1U1.9 Construct an explanation to demonstrate the relationship between major cell structures and cell functions (plant and animal).	Р	MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function.		
7.L1U1.10 Develop and use a model to explain how cells, tissues, and organ systems maintain life (animals).	NC	There is no strong or partial correlation to an NGSS standard in this grade band.		
7.L1U1.11 Construct an explanation for how organisms maintain internal stability and evaluate the effect of the external factors on organisms' internal stability.	NC	There is no strong or partial correlation to an NGSS standard in this grade band.		
7.L2U1.12 Construct an explanation for how some plant cells convert light energy into food energy.	Р	MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.		



Alignment of the AzSS to NGSS Performance Expectations

Note: An "S" or "P" alignment indicates that an NGSS resources could be used. An "NC" indicates that an NGSS resources cannot be used.

- S = Strong: Both the Core Idea and Science and Engineering Practice (SEP*) are the same
- P = Partial: Core idea is closely related; SEP may or may not match
- NC** = Not Closely Correlated: There is no strong or partial correlation in this grade band

3-Dimensions in Bundled Standards

7.L1U1.9 Core Ideas for Knowing Science* Core Ideas for Using Science* Physical Science U1: Scientists explain phenomena using P1: All matter in the Universe is made of very small particles. evidence obtained from observations and Construct an explanation to demonstrate the P2: Objects can affect other objects at a distance. or scientific investigations. Evidence may relationship between major cell structures and cell P3: Changing the movement of an object requires a net force to be acting on it. lead to developing models and or P4: The total amount of energy in a closed system is always the same but can be transferred functions (plant and animal). theories to make sense of phenomena. from one energy store to another during an event. As new evidence is discovered, models Earth and Space Science and theories can be revised. E1: The composition of the Earth and its atmosphere and the natural and human processes U2: The knowledge produced by science is 7.L2U1.12 occurring within them shape the Earth's surface and its climate. used in engineering and technologies to E2: The Earth and our solar system are a very small part of one of many galaxies within the solve problems and/or create products. Universe. Construct an explanation for how some plant cells U3: Applications of science often have both Life Science L1: Organisms are organized on a cellular basis and have a finite life span. positive and negative ethical, social, convert light energy into food energy. L2: Organisms require a supply of energy and materials for which they often depend on, or economic, and/or political implications. compete with, other organisms. L3: Genetic information is passed down from one generation of organisms to another. L4: The unity and diversity of organisms, living and extinct, is the result of evolution.

Science & Engineering Practice(s)







Developing and Using Models



Crosscutting Concepts







Arizona Science Standards in Lesson

Life Sciences: Students develop an understanding of the structure and function of cells.

Life Science Standards	Crosscutting Concepts and Background Information for Educators		
7.L1U1.8 Obtain, evaluate, and communicate information to provide evidence that all living things are made of cells, cells come from existing cells, and cells are the basic structural and functional unit of all living things.	Crosscutting Concepts: Patterns; Cause and Effect; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change ⁴ Background Information: All living organisms are made of one or more cells, which can be seen only through a microscope. All the basic processes of life are the results of what happens inside cells cells divide to replace aging cells and to replace more models in research and the trained of the trained of the trained of the more models in the second processes of the trained of the	Working with Big deases or science Education	
7.L1U1.9 Construct an explanation to demonstrate the relationship between major cell structures and cell functions (plant and animal).	cells and to make more cells in growth and perepoduction rood is the energy source they need in order to carry out these and other function. $2^{(p.26)}$ life is the quality that distinguishes living things - composed of living cells, from nonliving objects or those that have died. While a simple definition of life can be difficult to capture, all living things - that is to say all organisms - can be characterized by common aspects of their structure and functioning $4^{(p.143)}$ Some cells in multicellular organisms , as well as carrying out the functions that all cells do, are specialized ; for example, muscle, blood and nerve cells carry out specific functions within the organism. Cells are often aggregated into tissues, tissues into organs, and organs into organ systems . In the human body, systems carry out such key functions as respiration, digestion, elimination of waste and temperature control. The circulatory system takes material needed by cells to all parts of the body and removes soluble in state.	A FRAMEWORK FOR	1
7.L1U1.10Develop and use a model to explain how cells, tissues, and organ systems maintain life (animals).	to the urinary system takes inaternal needed by cens to an parts of the body and removes soluble wave to the urinary system. Stem cells, which are not specialized, are capable of repairing tissues by being programmed for different functions. Cells function best in certain conditions. Both single cell and multi-cellular organisms have mechanisms to maintain temperature and acidity within certain limits that enable the organism to survive. ² (p. ²⁶) Organisms are complex, organized and built on a hierarchical foundation of elements and atoms to cells and systems of individual organisms to		



Science Performances – Students making sense of phenomena



Teaching Science is Phenomenal

Using Phenomena to Engage Students in Three-Dimensional Science Performances Consistent with the NRC Framework and NGSS



Organizing Student Science Performances Using 5E and Gather, Reason, Communicate Instructional Sequences

Brett D. Moulding & Rodger W. Bybee







GRC Approach





Adapted from PD with Brett Molding with ADE & SRP, November 2019

GRC Approach

Phenomena-Based Teaching & Learning

Engage students in observing phenomena and provide students the opportunity to develop meaningful questions to investigate the causes of the phenomena.



<u>Motivate</u> students to apply their knowledge of science to make sense of other phenomena, outside of the classroom.



Students will **gather** information and data which they will use to support their explanations. Students will also <u>reason</u> to analyze data to use as evidence and <u>communicate</u> their findings.

#Going3D w/GRC 7th Grade Lesson

Phenomenon: Leaves are darker on the top than the underside.

Group Performances:

- 1. Explore leaves by going outside to collect two leaves from 3-5 different plants.
- 2. *Observe* leaves carefully and look for *patterns* across all of the leaves.

Class Discussion about Patterns

Performances

Continue Group Performances:

3. *Develop questions* to obtain information about the *patterns* they observe of leaves being a different shade of green on the top than on the bottom.

Class Discussion about good Questions

Continue Group Performances:

- 4. *Obtain information* from reliable sources to use as evidence for how the *structure* of the leaf *structure functions* to meet the needs of the plant.
- Construct explanations for how the structure of the darker top and light underside of leaves functions in leaves.
- 6. *Develop a model* to show differences in the *structure* of cells on the top and bottom of a leaf.

Class Discussion

7. *Revise and use your model* to support an *explanation* for how a cell as a whole and ways the parts of the cell contribute to the *function*.

Individual Performances: (SSW)

 Develop an argument for how the evidence you have gathered supports the explanation that the structure of the leaf functions to meet the needs of the plant. (SSW)

Blue = Science & Engineering Practices

Green = Crosscutting Concepts



7th Grade GRC Lesson- Green Leaves

Gather



Group Performance- in Pairs (if w/students)

- *Explore* leaves by going outside to collect two leaves from 3-5 different plants. The leaves may be from trees, bushes, weeds, and/or flowers.
- **Observe** leaves carefully and look for **patterns** across all of the different species of leaves. **Write a list of observed patterns** in a S-T-W table.

6 Alone Zone S-T-W Table

See-Think-Wonder Table (forced copy)





Leaves from 5 Different Species

Gather

Leaves

Video

Observe leaves carefully and look for **patterns** across all of the different species of leaves. Write a list of observed patterns in a S-T-W table.

Topside

Underside







See-Think-Wonder

Green Leaves

Alone Zone (2 minutes)

Carefully **observe** the leaves and look for **patterns.** Complete the see-think-wonder chart below. You should record observations ("I see..."), ideas you have about what is going on ("I think..."), and questions that you would like to investigate ("I wonder...").





Noticings & Patterns Jamboard

Small Group

<u>MOVE 1</u>: Share observations with your group:

- Review your observations
- Choose two observations to post



 Post your observations on Jamboard (one observation per sticky note) Please post on **BLUE**

Move 2: When posting slows:

- Circle at least one observation someone in your group noticed that you did not (multiple people can circle the same observation)
- Put a check mark next to at least one observation someone noticed that you also noticed.
- Post patterns your group identifies GREEN





Class Discussion About Patterns & Predictions

Whole Group Noticings/Patterns: (I will take notes)



Asking Questions

Continued Group Performance (3 minutes Alone Zone)

Phenomenon - Leaves are green, however the top side of a leaf is a different shade of green than the bottom side of the leaf.

• *Develop questions* to obtain information about the *patterns* you observe of leaves being a different shade of green on the top than on the bottom.



Wonderings Waterfall- Whole Group Share

Before typing in chat box:

- Review your own observations and the observations of your group.
- Review and/or add to the questions you recorded in "I wonder" column of your table.
- Choose one question to share that answering may help us make sense of the phenomenon.

Type in chat box, but DO NOT HIT ENTER!

(wait for countdown- 3,2,1..waterfall!)









Phenomenon: Leaves are darker on the top than the underside.

Group Performances:

- 1. *Explore* leaves by going outside to collect two leaves from 3-5 different plants.
- 2. *Observe* leaves carefully and look for *patterns* across all of the leaves.

Class Discussion about Patterns

Continue Group Performances:

 Develop questions to obtain information about the patterns they observe of leaves being a different shade of green on the top than on the bottom.

Class Discussion about good Questions

Continue Group Performances:

- Obtain information from reliable sources to use as evidence for how the structure of the leaf structure functions to meet the needs of the plant.
- Construct explanations for how the structure of the darker top and light underside of leaves functions in leaves.
- 6. *Develop a model* to show differences in the *structure* of cells on the top and bottom of a leaf.

Class Discussion

 Revise and use your model to support an explanation for how a cell as a whole and ways the parts of the cell contribute to the *function*.

Individual Performances: (SSW)

8. **Develop an argument** for how the evidence you have gathered supports the **explanation** that the **structure** of the leaf **functions** to meet the needs of the plant. (SSW)

Investigation: Green Leaves

Gather

Read Article & Gather Information

Gather

Obtain information from reliable sources for how the structure of a leaf functions to meetthe needs of the plant.

Alone Zone (6 minutes)

Read the article and annotate as you wish. Be mindful to look for information about *structure and function*.



What Makes Plants Green?

The green color in plants is caused by the presence of chloroplasts inside plant cells. Chloroplasts contain chlorophyll, the molecule that captures energy from the sun to rearrange carbon dioxide and water into sugar. This process that happens in the chloroplast is called photosynthesis. The green color of chlorophyll is why plants are mostly green.

Chlorophyll is one of several pigments in plants that absorb light energy. Each type of plant reveals the color of the pigmentation that best allows them to absorb sunlight based on light conditions in the environment where they live. Some environments are bright, some are darker, but all provide some light or the plant could not live. The amount of sunlight in the desert is greater than the amount of light in a dark forest, so the shade of green for plants from these two environments are different.

During autumn, plants and leaves in some locations change color to red, orange, and/or yellow. This process is due to the plant receiving less sunlight each day. When plants receive



less sunlight it triggers a process in the plant that reduces the amount of chlorophyll in the cells of the leaves and changes the chlorophyll so it can be stored for the winter. The decrease in sunlight causes the plants to take apart the chlorophyll and store the parts of the molecules. When this happens other natural pigmentation in the plants can be seen because they are not hidden by the green color of the chlorophyll.



Phenomenon: Leaves are darker on the top than the underside.

Group Performances:

- 1. *Explore* leaves by going outside to collect two leaves from 3-5 different plants.
- 2. *Observe* leaves carefully and look for *patterns* across all of the leaves.

Class Discussion about Patterns

Continue Group Performances:

3. *Develop questions* to obtain information about the *patterns* they observe of leaves being a different shade of green on the top than on the bottom.

Class Discussion about good Questions

Continue Group Performances:

- Obtain information from reliable sources to use as evidence for how the structure of the leaf structure functions to meet the needs of the plant.
- 5. *Construct explanations* for how the *structure* of the darker top and light underside of leaves *functions* in leaves.
- 6. *Develop a model* to show differences in the *structure* of cells on the top and bottom of a leaf.

Class Discussion

 Revise and use your model to support an explanation for how a cell as a whole and ways the parts of the cell contribute to the *function*.

Individual Performances: (SSW)

8. **Develop an argument** for how the evidence you have gathered supports the **explanation** that the **structure** of the leaf **functions** to meet the needs of the plant. (SSW)

Investigation: Green Leaves

Reason

Constructing Explanations- Group Performance

Reason

Construct explanations for how the *structure* of the darker top and light underside of leaves *functions* in leaves.

Develop a model to show differences in the *structure* of cells on the top and bottom of a leaf.



Make a Group:

Please enter your name in the first available cell, **filling the table from left to right** and then top to bottom. Click on your group number, then click on Bookmark to quickly navigate to your group's table.

Group 1		
Group 2		
Group 3		
Group 4		
Group 5		
Group 6		

Click on your group number to quickly find your table Group 1 Group 2 Group 3 Group 4 Group 5 Group 6

Alone Zone

Develop a model to show differences in the *structure* of cells on the top and bottom of a leaf. *Construct an explanation* supported by evidence for how the leaf *structure* (darker green on top) is consistent with the *function* of the leaf as part of the plant *system*.



Small Group

Identify at least one similarity and one difference between your model and another group member's





"Breakout" Rooms- Share & Discuss Models



Class Discussion & Revisions

Reason Class Discussion: Open chat



Questions to initiate Discussion:

Q: What structure in plant cells causes the green coloration of the leaf? Q: How does the structure of the top side of a leaf differ from the bottom side? Q: Why is the function of the top of a leaf different from the function of the underside of a leaf?

- *Q*: *What is the role of the leaves in the plant system?*
- *Q: Why is energy input important to cells of the leaf?*
- *Q: Where does the matter come from for the process of photosynthesis?*



Phenomenon: Leaves are darker on the top than the underside.

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- 2. *Observe* leaves carefully and look for *patterns* across all of the leaves.

Class Discussion about Patterns

Continue Group Performances:

3. *Develop questions* to obtain information about the *patterns* they observe of leaves being a different shade of green on the top than on the bottom.

Class Discussion about good Questions

Continue Group Performances:

- Obtain information from reliable sources to use as evidence for how the structure of the leaf structure functions to meet the needs of the plant.
- Construct explanations for how the structure of the darker top and light underside of leaves functions in leaves.
- 6. *Develop a model* to show differences in the *structure* of cells on the top and bottom of a leaf.

Class Discussion

7. *Revise and use your model* to support an *explanation* for how a cell as a whole and ways the parts of the cell contribute to the *function*.

Individual Performances: (SSW)

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Investigation: Green Leaves

Reason

Revisit Model & Explanation- Add to it!

Developing and Using

Constructing

Explanations



Phenomenon: Leaves are darker on the top than the underside.

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Class Discussion about Patterns

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Class Discussion

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Individual Performances: (SSW)

8. **Develop an argument** for how the evidence you have gathered supports the **explanation** that the **structure** of the leaf **functions** to meet the needs of the plant. (SSW)

Investigation: Green Leaves

Communicate

Evidence for Arguments

Communicate

Individual Performances: (SSW) *Develop an argument* for how the evidence you have gathered supports the *explanation* that the *structure* of the leaf *functions* to meet the needs of the plant. (SSW)





Support for Individual Performance - Evidence Collector & Sentence Frames

Evidence Collector for Engag	ing in Argument from Evidence		
1. Construct explanations for how the structure of the darker to			
Evidence from Data in S-T-W Chart: ●	How does this evidence support the explanation?		
Evidence from Reading: ●	How does this evidence support the explanation?	<u>Sent</u>	tence Frames: andfunction together to
Evidence from Class Discussion ●	How does this evidence support the explanation?	•	The
 Develop an argument for how the evidence you gathered in t structures in leaves function to meet the needs of the plant syst 	he investigation support/refute your group's explanation em.	•	
Possible sentence starters for evidence:	Possible sentence starters for reasoning/support:		
One piece of evidence is	This is important because	,	
Another piece of evidence is	This shows that		
One observation/I notice	This proves that		
The pattern our group noticed was	This supports the evidence because		
The reading states,	This evidence suggests that, which means		
During the class discussion, our class figured out	The pattern our group noticed was this means		

Evidence of Learning- Formative Assessment

Formative Assessment for Student Learning

Elicit Evidence of Learning: *Develop an argument* for how the evidence they have gathered supports the explanation that the *structure* of the leaf *functions* to meet the needs of the plant.

Evidence of Student Proficiency

Student models provide evidence of the relationship between the structure and function in a leaf system evidence for the transformation of energy in the process of photosynthesis inputs and outputs of matter in the leaf system causes for the difference in color between top and bottom of the leaf.

Range of Typical Student Responses

Descriptors of grade-level-appropriate student responses:

- Full understanding The model shows a higher concentration of chloroplasts at the top of the leaf and connects concentration to the difference in color between top and bottom. The model represents the effect of sunlight on the process of photosynthesis. The model shows the rearrangement of matter (oxygen, sugar, carbon dioxide, and water)
- Partial understanding The model shows a higher concentration of chloroplasts at the top of the leaf, but does not make the connection to the function of the chloroplasts or color difference between top and bottom. The model represents sunlight but does not directly connect to the process of photosynthesis. The model shows the rearrangement of some of the types of matter (oxygen, sugar, carbon dioxide, and water)
- Limited understanding The model does not include the role of light inputs in the system. The model indicates that there is more photosynthesis or more chloroplasts at the bottom of the leaf. The model may include a formula but does not show evidence of a connection between the formula and processes involved in photosynthesis.

Acting on Evidence of Learning

Description of instruction action and response to support student learning.

- Engage in Simulations of photosynthesis and add understanding to their model
- <u>https://learn.concord.org/resources/1101/photos</u> <u>ynthesis</u>
- <u>http://www.reading.ac.uk/virtualexperiments/ves</u> /preloader-photosynthesis-full.html
- extensions of learning for students who display a full understanding
- Gather information on leaf pigmentation <u>http://harvardforest.fas.harvard.edu/leaves</u>

<u>/pigment</u> and make connections to change in fall colors of leaves.



Revisit the Phenomena

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Class Discussion about Patterns

Continue Group Performances:

 Develop questions to obtain information about the patterns they observe of leaves being a different shade of green on the top than on the bottom.

Class Discussion about good Questions

Continue Group Performances:

- Obtain information from reliable sources to use as evidence for how the structure of the leaf structure functions to meet the needs of the plant.
- Construct explanations for how the structure of the darker top and light underside of leaves functions in leaves.
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Individual Performances: (SSW)

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Standards that Spiral-Leaves

Leaf Structure and Function – Turning Over a New Leaf

K.L1U1.6 Obtain, evaluate, and communicate information about how organisms use different body parts for survival.

2.L2U1.9 Obtain, analyze, and communicate evidence that organisms need a source of energy, air, water, and certain temperature conditions to survive.

3.L1U1.5 <u>Develop and use models</u> to explain that plants and animals (including humans) have internal and external structures that serve various functions that aid in growth, survival, behavior, and reproduction.

7-LS2U1.9 <u>Construct an explanation</u> to demonstrate the relationship between major cell structures and cell functions (plant and animal).

7-LS2U1.12 Construct an explanation for how some plant cells convert light energy into food energy.

8.L4U1.11 <u>Develop and use a model</u> to explain how natural selection may lead to increases and decreases of specific traits in populations over time.

HS.L2U1.21 Obtain, evaluate, and communicate data showing the relationship of photosynthesis and cellular respiration; flow of energy and cycling of matter.

Plus HS+B.L2U1.8 <u>Develop and use models</u> to develop a scientific <u>explanation</u> that illustrates how photosynthesis transforms light energy into stored chemical energy and how cellular respiration breaks down macromolecules for use in metabolic processes.



Simplicity of Phenomena

MS-LS1-2 Cell structure and function	The Root of the Matter *	HI	Cell Parts & Function	Phenomenon: Roots are not green.	GRC Explore Explain	The investigation provides insights into differences in how cells function. Includes formative assessment
MS-LS1-2 Cell structure and function	Hairy Roots		This lesson still needs to be developed	Plant roots are hairy looking. Some are more hairy looking than others.		
MS-LS1-2 Cell structure and function	Where's My <u>Nucleus</u> *	PA	Cells and Organelles Structure and Function	Phenomenon: Red blood cells do not have a nucleus.	GRC	A good lesson to start a unit on organelles Includes formative assessment
MS-LS1-3 Hierarchy of systems in organisms	Chicken Feet and Muscles *	UT OK	Hierarchy of cells, tissues, organs, and organs systems	Phenomenon Chicken feet are made of chicken parts. Phenomenon : A Chicken foot does not have large muscles.	GRC Working on 5E	This investigation has students using chicken feet to understand structure and function. Includes formative assessment
MS-LS1-3 Hierarchy of systems in organisms	My Pulse *	AZ	Circulatory System	Phenomenon : I can feel my pulse in my neck after I exercise.	GRC	This investigation use prepared slides of blood and tissue. includes formative assessment
MS-LS1-3 Hierarchy of systems in organisms	<u>Health Report</u>	NY	Interacting Systems of Cells	Phenomenon: In the United States alone, roughly 22 million people have been diagnosed with asthma,	GRC Engage and	This lesson model and then engages students in developing reports about the effects of diseases on



Thank you for sharing this space!

What questions do you have?



Use a strategy called "stack"- helps build a virtual "line" or stack





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