

PROJECT DESIGN: OVERVIEW				page 1	
Name of Project: The Game of Life: Plant and Animal Cells Vs. Microorganisms			Duration: 3 weeks		
Subject/Course: Life Science		Teacher(s):		Suggested Grade Level: 5th	
Other subject areas to be included, if any: Language Arts, Visual Art, Technology, Social Studies					
Key Knowledge and Understanding <i>(CCSS or other standards)</i>	<p>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.</p> <p>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.</p> <p>SS5E3 Describe how consumers and producers interact in the U. S. economy.</p> <p>VA5.CR.3 Understand and apply media, techniques, processes, and concepts of two dimensional art. a. Refine drawings and paintings with a variety of media (e.g. pencil, crayon, pastel, charcoal, tempera, watercolor, acrylic). c. Utilize a variety of materials in creative ways to make works of art (e.g. mixed-media, collage, or use of available technology). d. Refine knowledge of multiple color schemes to create works of art (e.g. monochromatic, analogous, neutral, complementary). e. Apply multiple spatial concepts to create works of art (e.g. one point perspective, atmospheric perspective, positive and negative space).</p> <p>VA5.CRA Understand and apply media, techniques, processes, and concepts of three- dimensional works of art. Create clay objects, demonstrating refinement of combined hand-building techniques (e.g. pinch method, coil method, slab, surface design). Create sculpture that demonstrates a design concept using a variety of methods (e.g. papier-mâché, paper sculpture, assemblage, found object sculpture). Create works of art using traditional and/or contemporary craft methods (e.g. weaving, stitchery, puppetry, batik, jewelry, book arts).</p>				
Success Skills <i>(to be taught and assessed)</i>	Critical Thinking/Problem Solving		X	Self-Management	X
	Collaboration		X	Other: Communication	X
Project Summary <i>(include student role, issue, problem or challenge, action taken, and purpose/beneficiary)</i>	<p>Students will design games that feature plant and animal cells. Students will play the original “Game of Life” either by using the board game or the digital version. They will study the parts of plant and animal cells, learning what similarities and differences exist. Students will also research the effect that microorganisms have on plant and animal cells. Students will learn game theory by playing board games and computer games or apps and then work in groups to create a game that teaches. Students will also hear from forestry industry professionals and/or other specialists that can speak to the ways that good microorganisms support healthy plant growth and bad microorganisms actually harm the cells of plants and animals. Students will create research guides for cells and microorganisms that would help with designing a game. Individually, students will write a narrative/ comic book that explains a cell vs. microorganism experience, which will serve as the basis for their game. Next, the students should find a couple students with narratives that work with their own to develop the game. They should join forces to create a game- either an app or board game that shows differences/similarities of plant and animal cells as well as the effects of microorganisms on those cells. Students will have a game showcase for the community.</p>				

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Driving Question	How might businesses benefit from knowledge of plant and animal cells and the ways that microorganisms benefit or harm the cells?	
Cross-Cutting Concept	Compare and Contrast	
Disciplinary Core Idea	Plants and animal cells are different and both may be harmed or may benefit from microorganisms.	
EQ	How do plant cells differ from animal cells? How can microorganisms help or harm cells?	
Entry Event	<p>Day 1: The teacher divides students into small groups. Each group plays either the board game version of Life or the digital version of Life for about 20-30 minutes. Then the teacher asks students to stop and leads a group discussion about how a player moves through the game and makes progress. Students identify how positive and negative things happen to the players and give some examples. The teacher then explains that the students will design/create games (<i>digital or board</i>) that move "plant and animal cell" players through the game of life. The teacher then explains that in order for any game designer to create an exciting educational product, research is needed. The teacher shares that they would start making their games tomorrow by learning about cells and microorganisms.</p> <p>Day 2: The teacher should show a fast slideshow or powerpoint of different images of microorganisms (<i>20 images in 5 minutes or less</i>) providing very little context. Then the students should go on a nature walk in small groups searching for microorganisms on the walk. Students should capture images of the microorganisms using digital cameras, cell phones, ipads or other electronic devices. Students should document their images, noting locations and making notes of surrounding circumstances in their journal. Upon returning to class, the teacher should explain that microorganisms can be helpful or harmful to plants and animal cells while showing a couple examples from the previous slide show and discussing their role in the life cycle of cells.</p>	
Products	<p>Individual: Create a research study guide of parts of a plant cell and animal cell as well as different types of microorganisms and their effects on cells that could be used by game designers and/or players of the game if more information is needed by players.</p>	<p>Specific content and competencies to be assessed:</p> <p>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 (<i>membrane, wall, cytoplasm, nucleus, chloroplasts</i>) and of an animal cell (<i>membrane, cytoplasm, and nucleus</i>). c. Construct an explanation that differentiates between the structure of plant and animal cells.</p> <p>S5L4. Obtain, evaluate, and communicate information about how microorganisms benefit or harm larger organisms. (<i>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.</i>) 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.</p>

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	<p>Individual: Write a narrative/comic book that explains a cell vs. microorganism experience, which will serve as the basis for their game.</p>	<p>Specific content and competencies to be assessed: ELAGSE5W3: Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences. a. Orient the reader by establishing a situation and introducing a narrator and/or characters; organize an event sequence that unfolds naturally. b. Use narrative techniques, such as dialogue, description, and pacing, to develop experiences and events or show the responses of characters to situations. c. Use a variety of transitional words, phrases, and clauses to manage the sequence of events. d. Use concrete words and phrases and sensory details to convey experiences and events precisely. e. Provide a conclusion that follows from the narrated experiences or events.</p>
	<p>Team: Design a game board or app that moves a plant or animal through interactions with various microorganisms.</p>	<p>Specific content and competencies to be assessed: 5L3. 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 (<i>membrane, wall, cytoplasm, nucleus, chloroplasts</i>) and of an animal cell (membrane, cytoplasm, and nucleus). c. Construct an explanation that differentiates between the structure of plant and animal cells. 5514. Obtain, evaluate, and communicate information about how microorganisms benefit or harm larger organisms. (<i>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.</i>) 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.</p>

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		<p>VA5.CR.3 Understand and apply media, techniques, processes, and concepts of two dimensional art. a. Refine drawings and paintings with a variety of media (e.g. pencil, crayon, pastel, charcoal, tempera, watercolor, acrylic). c. Utilize a variety of materials in creative ways to make works of art (e.g. mixed-media, collage, or use of available technology). d. Refine knowledge of multiple color schemes to create works of art (e.g. monochromatic, analogous, neutral, complementary). e. Apply multiple spatial concepts to create works of art (e.g. one point perspective, atmospheric perspective, positive and negative space).</p> <p>VA5.CRA Understand and apply media, techniques, processes, and concepts of three- dimensional works of art. Create clay objects, demonstrating refinement of combined hand-building techniques (e.g. pinch method, coil method, slab, surface design). Create sculpture that demonstrates a design concept using a variety of methods (e.g. papier-mâché, paper sculpture, assemblage, found object sculpture). Create works of art using traditional and/or contemporary craft methods (e.g. weaving, stitchery, puppetry, batik, jewelry, book arts).</p>		
Making Products Public (include how the products will be made public and who students will engage with during/at end of project)		Students will present their projects (study guides, comic books, and games) at the end of the project to 5th grade students at another local school.		
Resources Needed		On-site people, facilities: outdoor access to school campus, technology integration specialist Equipment: laptops, iPads or tablets, Internet access Community Resources: forestry outreach representative(s), a master gardener from the community, or expert from a local plant nursery		
Reflection Methods (how individual, team, and/or whole class will reflect during/at end of project)	Journal/Learning Log	X	Focus Group	
	Whole-Class Discussion	X	Fishbowl Discussion	
	Survey		Other: Digital Portfolio	X
<p>Notes: Georgia has 24.7 million acres of forestland providing 144,000 jobs and generating a \$35.2 billion economic impact. As a result, forestry is Georgia’s second largest industry. Prior to starting the PBL lesson, contact your local environmental agency’s (i.e. forestry, conservation, nature centers, 4-H, etc.) outreach program to request a guest speaker who will discuss the important role that cells play in modern times producing the highest quality product. Also, this professional would address the impact that microorganisms have on forestry in Georgia.</p>				