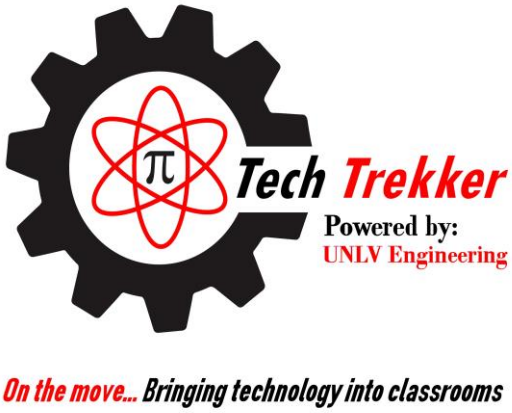
Gardening: Outdoor Learning Simulation



UNLV | Howard R. Hughes College of Engineering

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Project Overview:

Throughout this unit, which should take approximately 4-6 weeks depending on your pacing and classroom needs, students will be learning about what makes plants thrive, how organisms interact with one another in a garden, and how to set up a water system. There are a number of current environmental issues in the press that can be utilized for generating a discussion with global impact. One way to see the global impact is to examine the local impact of change over time. Students will examine the ecosystems within a garden and the interactions within those ecosystems, as well as evaluate change over time, with materials that will help provide them with foundational knowledge to apply to global concerns in the future.

Students will be learning about the scientific elements of the garden, reading and analyzing literature around the theme of creating positive changes that will help the environment, and building a community, while also participating in research assignments that will ultimately lead them to create a design for their own school garden. Students will develop and grow as citizens by learning to be contributory members of society or communities.

The garden project leads to the partnership with the Tech Trekker program by having them come out to survey the land around the school to help students make a more informed decision as to where the garden should go. There will be the option of having the Tech Trekker 3D-print pre-selected segments and/or a component of their irrigation system for the garden model. Finally, the Tech Trekker team can demonstrate the Carvey mini-milling machine. Then the winning design can be mapped out on the Carvey mini-milling machine by the Tech Trekker team and delivered to your school at a later date.

Science Activities can be done in any order after introducing the Garden Design Project:

Timeline of Activities:	Duration of Activity:
Seeds of Change	60-75 minutes
Planting the Trees of Kenya	60-75 minutes
Rachel Carson and The Book that Changed the World	60-75 minutes
The Tree Lady	60-75 minutes
Garden Visions Project Overview Make a reservation with Tech Trekker before introducing the project to students.	This is when you could introduce the actual Garden Visions Project. If this is the first time you will be going over a Design Process like this, you may want to spend some time on explaining the process. Then help students to not be overwhelmed by chunking the tasks and explaining that you will be completing some science lessons to help them learn more about the garden.
Living Necklace	50 minutes; then additional daily journaling for 2 weeks
Soil as a Mixture/Solution	50 minutes
Water Wise	50 minutes
Sun Dial	50 minutes; then observation throughout the school day.
The Good Garden	60-75 minutes
Up in the Garden Down in the Dirt	60-75 minutes

To make your reservations, or to make general inquiries, please refer to the following links:
This is a printable flyer that can also be distributed to colleagues.
https://www.unlv.edu/system/files/file_attachments_private/Tech%20Trekker%20Flyer.pdf
Use this link to make your reservations for a Tech Trekker visit: http://techtrekker.egr.unlv.edu/

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Standards Addressed Throughout Unit:

Writing	Reading	Speaking/ Listening	Science	Math
W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. W.5.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. W. 5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.	RL 5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. RL 5.2 Determine a theme of a story, drama, or poem from details in the text, including how characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text. RL 5.4 Determine the meaning of words and phrases as they are used in a text, including figurative language such as metaphors and similes. RL 5.9 Compare and contrast stories in the same genre (e.g., mysteries and adventure stories) on their approaches to similar themes and topics.	SL.5.1a Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. SL 5.4: Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace. SL 5.5: Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.	5-LS2-1 5-PS3-1 5-ESS1-2 5-ESS2-1 5-ESS3-1 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3	5.NBT.B.7 Add, subtract, multiply, and divide decimals 5.NF.B.5 interpret multiplication of fractions as scaling 5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Garden Phenomena

Phenomena: What is food, where does it come from, and how do organisms use it? How do matter and energy move through the ecosystems of the biosphere?

Scenario: Green Our Planet is an organization that challenges schools to design and construct a garden scape that will become an outside learning lab for all grade levels. The principal will be awarding the group with the most viable plan with an opportunity to see their designs come to life. The criteria of the project will guide you as you generate ideas and plans, and research the tools that need to be considered. Your teacher will be guiding you through the engineering process.

Driving Question: How do we create the ultimate construction site that utilizes natural resources for the purposes of planting, to generate food for a community learning lab of various life cycles, and other human interactions?

Learning Standards:

3-5-ETS 1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5 ETS 1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5 ETS 1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

5-ESS2-1 & 5-ESS3-1. A system can be described in terms of its components and their interactions.

Teacher's Guide for the Steps of the Design Process:

Define the Problem:

Teacher will conduct a class discussion and create anchor charts of ideas that students come up with in order to help guide their design creations. This is a spot where you may want to let them know up to 3 constraints that you have for them, and the remaining 3 constraints/criteria can be decided in their small groups. *Part of the Design Brief can be filled in here, while the Design statement and the rest of the criteria/constraints will need to be completed once the design groups are formed.* Some criteria groups may want to come up with are:

- Must be shaded for ____ part of the day.
- Must be conducive for (vegetables, fruits, herbs).
- Design must include a functioning watering system.
- Budget and Time
- Size (dimensions) of land that can be utilized

Generate Concepts:

Mini-Lesson Prepared and Presented by student expert groups:

- Students could be divided up into expert research groups and be responsible for teaching the class about their findings.

Student Research groups (or Roles):

- Groups can be 3-6 depending on your classroom needs.
  Each of the "expert groups" do not need to be limited to 1, there can be multiple groups of one expertise.

Horticulturist - Historical context of plants locally available, crop production, harvesting seasons, perennials vs. annuals. Are plants for pest control or will they attract animals?	Research types of plants then create a final list of 5-7 plants that are regionally grown and should be included in our garden. Answer the following questions for each plant and include the answers in your report: • What benefits do these plants have? • How do these plants contribute to nature or the food chain? • What are the needs of these plants?
Water Engineer - Use of simple machines to create water system; detection of water saturation and water collection, containment, and dispersal, as well as est time of day to water.	Research the water needs of the region for our garden: • How does water flow through land and other obstacles? • When is the best time of day to water the garden? • What watering options should be considered for our garden?
Material Engineer - Materials investigation: raised bed? tiered? size? shape?	Research the materials that are used in our region: • What materials would be best for our garden? • Why are some materials better than others?

Accountant	Research the cost of materials when purchased in bulk (contractor pricing) vs. consumer pricing.
Civil Engineer	Create a map of the school property, measuring out areas that already exist and would be off limits for a garden (playground, portables, or field area for PE). Include a key on your map so that fellow students know your measurement scale. Take multiple photos of the school property so perspective can be obtained from the classroom.

- After this has been presented, students brainstorm independently on a garden design.

- Finally, students will be put into groups:

    - The garden design will include one person from each expert group, so you will have groups of 5.
    - Students will share their brainstormed ideas and together fill out a decision matrix to come up with a final group design.

Design a Solution:

- In this step, students will be deciding in which location they would potentially like to place their garden.
- They will be completing a sketch of their final design, complete with measurements.
- They will be creating a cost analysis of the materials they will use and having a grand total calculated.

Build and Test:

- In this step students will be building a scale model of their garden – a mini-lesson on fractions as scaling may need to be here in order to get them started.
- Students will be receiving 3D printed tubing to add to their designs to show off their sprinkling systems, when the TechTrekker comes.

Evaluate Solution:

- Students will be creating a visual (Google SlideShow, Brochure, etc.) to support their explanation as to why this is the best design and should be selected as the winning design.

Present the Solution:

- Students will give an oral presentation “pitching” their garden design as the best garden design.
- Consider inviting parents and the administration team to this, so the students have an authentic audience.

Design Process Overview:

Step of Design Process	**Questions or activities that could be included in each step**	**Opportunities for Assessment** (see rubric for each step)
Define the Problem 1 week during writing time	● What makes a garden thrive? ● What benefits does a garden bring to the school? ● What needs to be considered as you create your design? (This can become a list of criteria and constraints; you can give some criteria/constraints, while some can be chosen by the groups themselves). ● What is the desired purpose of the garden? ○ If planting fruits and vegetables, how will we harvest and who receives the product? ● What is a learning lab?	● Class discussion/note taking ● Grade: Design Brief ● Grade: Expert research groups ● Some criteria to consider: ● Budget ● Size of the garden ● Location (example: must be away from frequent foot traffic).
Generate Concepts ½ hour to brainstorm their own ideas 45 minutes to complete the Decision matrix	● Utilizing the knowledge presented by the "expert groups," independently brainstorm your idea for a garden design (students are not placed into Garden Design groups until this step is completed) ● Put students into groups so that there are 5 "experts" in each group. As a group determine which design is best, using a decision matrix to rate the idea against the criteria/constraints.	● Grade individual brainstorming ● Grade the rationale of the Decision Matrix
Design a Solution 2 days	● Map two potential prime locations for the garden. (measure this space), with an explanation of why. ● Sketch a detailed plan of the garden design. Students may utilize a digital program including BlocksCAD. ● Utilizing the research that was done by the "expert," put together a list of materials and prices that are needed to build the garden.	● Grade the final sketch, which should include details like measurements.
PLAN AHEAD	● Surveyor could come out to help students decide which ONE location is most ideal. ● The same day they survey, they could demonstrate the Carvey (mini-milling machine), and 3D print irrigation component to be used to model.	● This should be booked ahead of time so that they are scheduled to come after the Design a Solution step is finished.
Build and Test 3 days	● Build a model of the garden design out of recycled materials. 5-LS2-1 ● Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment	● Students will keep a step by step journal of their building process: ● What revisions had to be made along the way? ● How were they successful? ● What got accomplished each day they were building?
Evaluate Solution 2 days	● Does your garden meet the criteria? ● How do you know the garden will thrive? ● Have you stayed within the budget-the budget is the materials that would need to be purchased to actually build the garden?	● Create a presentation that will be delivered to the class; the visual aid that is created to support the presentation will be graded here.

Present the Solution 1 day	● Prepare a presentation for the Principal and his/her advisory team about your role in this project: ○ Explain the process you worked through, the skills you used, what you learned, and how you know you came up with the best solution for your portion.	● Students will be graded on their speaking skills and the information included in the presentation.

Winning design gets their map milled. UNLV will print off site after the final design has been selected

Garden Visions Design Brief:

Client: Who are you designing the garden for?	
Designer: List the names of yourself and your group members who will be designing the garden.	
Problem Statement: Why is the task of building the garden necessary? Write a statement in your own words.	
Design Statement: Write a statement about how you and your team plan to tackle this task.	
Constraints/Criteria: List the criteria and constraints that you and your team will use to determine which design is the "best" design.	
Deliverables: What will be "turned in," to prove that you have worked through the design process to complete this task. (Review rubric).	

Activity: Living Necklace

Objective: SWBAT identify the resources necessary to sprout a seed, while experiencing the impact of the heat from the sun through a simulated environment, while documenting their findings in an observation process.

Standards:

- 5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water.
- 5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

Discussion:

As a part of a community you are being tasked with creating a more sustainable environment by forming a garden that is both producing products and a place to learn from.

- What is needed for plants to survive? (water, light, warmth, space) (Primary nutrients of Nitrogen, Phosphorus, Potassium (N-P-K))
- What types of plants are suitable for growing in our area? Garden space?
- How about with this method that we will use today? What will be the same/different from not using soil?

Materials: (Prep time 15 minutes for class distribution)

- Plastic 2"x 2" Jewelry Bags (1 per student)
- Water beads (3-4 per student): engorge with water prior to the lesson. (may take up to 6 hours) These can be purchased at Walmart or on Amazon.com.
- Yarn/String that can be used for the necklace portion. Approximately 24" in length per student.
- Hole punch.
- Seeds for planting and observations. Seeds should have a predicted sprout time of no longer than 10-14 days. Seeds like broccoli, celery, corn, kale and others will sprout within that time frame. (Any longer and you risk losing the necklace with students.)

Process:

- A hole is punched in the bag above the sealing line to adhere to the string.
- Water beads are placed in the bag along with seeds.
- Students will illustrate their observations over a period of time of wearing.
- Students should be able to make connections of heat as a source of energy. Heat being obtained from their body to help produce seed growth. The earth is heated from the sun source.

Additional Information:

*There are additional extensions with this process for more environmentally friendly or alternative considerations such as using egg shells for the seed containers.
https://extension.oregonstate.edu/sites/default/files/documents/10551/stemactivity-biologist-livingnecklaceagintheclassrom.pdf
Here are quick videos that show assembly and outcome samples: https://kscorn.com/necklace/.

Student Name: _____

Living Necklace

Data Log:

Kind of Seed:	Description of what is observed. Identify stage if possible.	Size/stage at time of observation.	Illustrations: 
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Day 6			
Day 7			
Day 8			
Day 9			
Day 10			
Day 11			
Day 12			

Living Necklaces Exit Ticket:

Name: _____

True or False: In order for a seed to sprout it must have sunlight, water, and soil.

What did the water beads simulate in this experiment? Write your answer in a complete sentence.

What role did your own body play in this experiment? Write your answer in a complete sentence.

Write a short response explaining how you have proven that plants can grow with just air and water.

Investigating Soil

Objectives:

- SWBAT determine how various soil elements, when altered, can be more conducive to their selected plants' growth, with proper maintenance and observation of natural element patterns developed for maintaining
- SWBAT saturate the soil materials to determine if changes in mass, structure, or consistency alter the usefulness of their soil.

Standards:

- 5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- 5.PS1-1 Develop a model to describe that matter is made of particles too small to be seen.
- 5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- 5-PS1-3 Make observations and measurements to identify materials based on their properties.
- 5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Teacher Background:
Students will be asked to identify parts of soil (minerals, organic matter, air and water)., and generate ideas of where they come from. This is a review of the food chain, erosion, water cycle, and earth's ecosystems. This can be completed with the Living Systems FOSS kit and/or the lesson from the Soil Science Society America: https://www.soils4teachers.org/files/s4t/lessons/lesson-plan--tea4science.pdf

The Living Systems Foss Kit offers several soil investigations that can be easily inserted here with composting, sorting soil and water flow with soil are options in this kit.

Extension/Enrichment: Evaluate the pH of the soil substance:
Various soils are present, and soil is measured with pH or the acidity or neutrality of the element. Various materials can be added to the soils to alter the pH, which are in the form of chemicals or other natural elements for a more organic soil. It is interesting that soils are considered sour if more acidic and sweet if more basic. Go to: https://www.soils4teachers.org/ for lesson extensions outside of the FOSS kit or this lesson.

Helpful links:
https://kidsgardening.org/lesson-plans-soil-texture-and-composition/
https://kidsgardening.org/lesson-plans-the-plant-soil-relationship/
https://kidsgardening.org/lesson-plans-decomposition-observation-bags/
https://www.soils4teachers.org/lessons-and-activities
https://utah.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=2

Activity: Sundial

Teacher Background: Sundials have been used in history to determine time of day and sun patterns for a variety of reasons, one of which being planting according to how much direct sunlight is obtained. Sunlight is the most elementary source of energy for many ecosystems.

Objective:

- SWBAT examine shadows that are both short and long, with measurements taken throughout the day and logged on a data sheet, to evaluate the length of time an area of land is exposed to direct, indirect, and shadowed light.
- SWBAT relate that information to how the movement of the sun and earth's rotation may impact the growth of plants.

Standards:

- 5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- 5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Discussion:

- If water and air are the primary elements to growth potential, why do we need the sun for plant growth?
- How will shadows be important? Can you think of other reasons that shadows or monitoring the sun would be helpful?

Procedure: Showing/explaining to students what a sundial looks like.

- Day 1 (1 hour): Students will generate ideas of how to create their sundials, which will include an element that can generate various shows that can be measured for length to determine sunlight exposure to potential plants. They will determine an accurate method of measure and place it outside. (The whole class can have 1 sundial from which to make observations, or a sundial in each potential garden location, top 2-5 if desired.)

- Day 2 (all day in interval rotation): Throughout the day students will work in teams to make brief observations and measurements of their sundial(s). Have the students work in teams so that as they step outside to investigate shadow movement and record their findings, there is a group observing at the o'clock – :15 after/past (quarter), :30 (half past), :45 (quarter until) – quarter of parts of the hour. If you need to divide into other groupings, shorten the time span, having the students learn to monitor their own intervals.

Assessment:
This is a justification as to why the location of the garden was selected. Data should be included in their science notebook/journal for their research of their garden location.

Online materials that show suggested materials and procedures for making a sundial:
http://www.greeneducationfoundation.org/institute/lesson-clearinghouse/270-make_a_sundial.html

Activity: Wise Watering Article

Introduction: Read the article https://kidsgardening.org/gardening-basics-wise-watering/, have students come up with a pro and con list for each type of irrigation system.

Standards:

- 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

*This will also be a review of simple machines, their functions and how they work together to perform a task.

In their STEM/STEAM notebook students should create a simple table or bullet list with their discoveries during the reading.

Type of Irrigation	Pros	Cons

Next, follow the lesson outline: https://www.ocstem.org/wp-content/uploads/Way-to-Flow-Water-Irrigation-Lesson-Plan-Advanced.pdf

Link this activity to creating a watering system for the garden could use the following: https://media.rubegoldberg.com/site/wp-content/uploads/2018/04/Rube-Goldberg-Resources.pdf as a resource to guide the connection.

Consider using each of the simple machine worksheets as a warm up each day to get their ideas flowing.

Student Name: _____

5.NBT.B.7 *Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.*

Cost Analysis of Project

Material	Cost for Material	How many of the items need to be purchased?	Total Cost: show your work, circle the total
Ex: 2x4 Kiln Dried Whitewood stud	$2.57	4	2.57 x 4

What is the grand total of the materials that are needed?

Activity: *Planting the Trees of Kenya: The Story of Wangari Maathai* by Claire A. Nivola
AR Book level 5.9

Standards:

- RI 5.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
- RL 5.9 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
- RL 5.7 Analyze how visual and multimedia elements contribute to the meaning, tone, or beauty of a text (e.g., graphic novel, multimedia presentation of fiction, folktale, myth, poem).
- RL 5.9 Compare and contrast stories in the same genre (e.g., mysteries and adventure stories) on their approaches to similar themes and topics.

Overview of both books:

Seeds of Change and ***Planting the Trees of Kenya*** are the same story written by two different people. One is full of description, dialogue, and figurative language, while the other is more direct and to the point.

Procedure:

- Read the book out loud.
- Have students compare and contrast the approach that each author took to writing the same story.
- Discuss multimedia elements: How does the visual presentation of a text support the author's message?
- Have students think about their opinions on the question: Which author wrote the story better? **OR** Which one was more moving, with the idea of making a change?
    - Students can come up with evidence to support their thinking and a debate can be facilitated.

RI 5.3 *Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.*

- Discuss the following questions:
    - What caused the harm to the land of Kenya?
    - How did Wangaria convince the women of Kenya help the land?
    - What happened as a result of their actions?
- In the book the author writes: "'When we see that we are part of the problem, she said, 'we can become part of the solution.'"
    - What are some problems in today's world that we can become part of a solution to?
    - Students can brainstorm or consider linking this to the garden project.

Activity: Read ***Seeds of Change*** by Jen Cullerton Johnson
AR Book level 4.8

Standards:

- RL 5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
- RL 5.2 Determine a theme of a story, drama, or poem from details in the text, including how characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text.
- RL 5.4 Determine the meaning of words and phrases as they are used in a text, including figurative language such as metaphors and similes.

Procedure:

- Review similes and metaphors.
- Read the story aloud.
- Consider a structure for answering some of the questions more informally than having students just write down answers.
    - Perhaps, they share as a group.
    - You could do a "Quiz/Quiz/Trade" method, where each student has a card with a question, and they roam around to find a partner, then ask the question, and the other person answers; then they switch roles, asking and answering; finally, they trade cards and find a new partner.
    - You could choose to have them independently answer ONE or TWO questions with cited evidence to grade.
- Closure: The whole group shares out ideas of what they thought the theme was.
    - Create an anchor chart with those ideas.
    - Then set the stage for the next day, when they will read another book with a similar theme.

Seeds of Change

Student Name: _____

Example	Type of Figurative Language	Literal meaning
Her mind swirled with curiosity like the currents in the stream.		
Wangari listened as still as a tree.		
Her mind was like a seed rooted in rich soil, ready to grow.		
People rushed through the trees like river water over stones.		
Wangari had an idea as small as a seed but as tall as a tree that reaches for the sky.		
Like a sturdy tree against a mighty wind, her faith kept her strong.		

Questions:

In what ways is the mugumo tree “home to many?”

Why was hugging the trunk of the tree like hugging her great grandmother’s spirit?

How is school for Wangari different than school for you?

What did Wangoria’s mother mean by “Where you go, we go?” What evidence do you have to support this?

Besides science, what did Wangari’s science professors teach her?

Besides helping the environment, what other change was Wangari working for?

Why were people cutting down forests? What effect did that have on village? Support your answer with cited evidence.

Why did Wangari and the women who helped her plant trees start calling themselves the “Green Belt Movement?”

What are some positive results of planting trees in Wangari’s village ?

How do Wangari’s actions teach us to be persistent, have patience, and stick to commitment? Why are these things important? Cite evidence from the text to support your thinking.

What do you believe the theme of this story is? Cite evidence to support your thinking

Activity: Read ***The Tree Lady*** by Joseph H. Hopkins
AR Book level: 4.8

Standards:
RL 5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
RL 5.2 Determine a theme of a story, drama, or poem from details in the text, including how characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text.
RL 5.9 Compare and contrast stories in the same genre (e.g. mysteries and adventure stories) on their approaches to similar themes and topics.

Procedures:
- Read the story aloud to students
- Facilitate a group discussion, this could be a whole group, this could be posing a question and having students discuss at their tables before reporting back to the whole group.
- Consider assigning ONE of the questions as an independent assignment for a grade.

Questions:

1. Notice how each page ends with "but Kate did," "but she did," or "but not Kate." How does the ending of each page help you determine the overall theme of the story? Explain your thinking with cited evidence from the story.

2. Think about the main character in the story *Seeds of Change*. How are Wangari and Kate alike? How are they different?

3. What lessons can we learn from each of these women? Support your thoughts with evidence from the text.

4. What common theme can be identified in both of these stories? Cite evidence to support your ideas.

5. What approach do the author's take to develop that theme? How are the stories alike? How are they different? Cite evidence to support your ideas.

Activity: Read ***Rachel Carson and Her Book that Changed The World*** by Laurie Lawlor
AR Book level 6.2

This book links to the previous books, as it is about another woman who pursued an education and career in science when it was not really normal to do so at the time.

Standards:

RL 5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
RL 5.2 Determine a theme of a story, drama, or poem from details in the text, including how characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text.
RL 5.9 Compare and contrast stories in the same genre (e.g. mysteries and adventure stories) on their approaches to similar themes and topics.

Procedure:

- Review what was similar about the two women who were the main characters of the last two books that were read. How were they alike? How were they different?
- Introduce that today you will read about another woman and how she too fought for change. Direct students to listen for *why she fought for change* and *how she fought for change.*
- Read the book aloud.
- Answer the following questions:
    - How does Rachel compare to Kate from *The Tree Lady* and Wangari in *Seeds of Change?*
    - What common theme do you think all three books have? Cite evidence to support your thinking.
- Consider copying or projecting from the Elmo page 26 for reference for students to answer the following question:
    - What lead to Rachel writing the book, *Silent Spring*? Cite evidence to support your thinking.
- Consider copying or projecting from the Elmo the final page of the book to answer this question:
    - What happened as a result of her book being published?
- Consider having students write a response to one of the questions as a grade.

Activity: Read ***The Good Garden: How One Family Went from Hunger to Having Enough*** by Katie Smith Milway
AR Book level 5.1

Standards:

- RL 5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
- RL 5.2 Determine a theme of a story, drama, or poem from details in the text, including how characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text.

Procedures:

- Explain that this book has some Spanish words mixed in, and for those of us that do not speak Spanish, we should be able to figure out the translation by using the context clues provided.
- Review types of figurative language, like personification.
- Read the story aloud to the students.
- Facilitate a group discussion with the questions provided.
- Consider having students answer ONE question for a grade.
- Add their ideas about the theme to the anchor chart that has already been started.
- Closure to this lesson can be an introduction to science, by having students connect this story to the garden project.

The Good Garden: How One Family Went from Hunger to Having Enough

How can we use context clues to define these Spanish words?

Word	Context Clue	English Translation
Padre		
Campesinos		
Madre		
Coyote		
Mi Carino		
Hasta pronto, mi nina		
loco		
Maestro		
Gracias a Dios		
Sombrero		
Mucho Gusto		
Tamales		

Discussion Questions:

- So many of Maria Luz's memories have grown from this patch of earth. What does this statement mean?
- Why was it not a good year for Maria's family in the garden. Cite evidence to support your answer.
- The wind pulls at Maria Luz's harias she walks to school. What type of figurative language is this? What is the literal meaning?
- How is Maria's school similar to Wagnalia's school? How is it different?
- What did the teacher mean when he said the school was good for bats and owls but not for children?
- In what way does the description of "Feeding the Soil" use the figurative language of personification? Cite evidence.
- What three main ideas does Don Pedro teach Maria and the campesinos about gardening? How can this knowledge help with your garden design?
- Why do you think the Coyote offered to take Maria's crops to market for her?
- Don Pedro's ideas are taking root in the hills of the village. What exactly does this mean? Cite evidence to support your thinking.
- Who initiates change in this story, Don Pedro or Maria Luz? Defend your answer with evidence from the text.
- What is the theme of this story? Cite evidence to support your thinking.

Making Connections to the Garden Project:

Maria and her father learned that the market was not a scary place, and that they could actually make more money than going through the Coyote. How could we turn our garden into a profitable fundraising for our school?

In the “New Beginnings” section, what did Maria and her father do differently with how they laid out their garden? How can this help you to think about the layout of your garden design?

What three main ideas does Don Pedro teach Maria and the campesinos about gardening? How can this knowledge help with your garden design?

Activity: Read ***Up in the Garden and Down in the Dirt*** by Kate Messner
AR book level 5.0

Procedure:

- Read the book aloud to students
- Have students answer the following question with a partner, writing down their ideas.
    - In the other books, we have read that the main character helps build the community by planting trees or learning how to better make a garden thrive. In this book, how does the author show that a garden is a community in itself? Cite evidence to support your thinking.
- In small groups have students create a Venn Diagram comparing and contrast "*Up in the Garden* vs. *Down in the Dirt*."
    - Mix groups up and then have students summarize in a new small group what they learned is happening down in the dirt.
    - Mix it up again and then have students summarize what is happening up in the garden.
- Have the book available to students or make copies of the last pages "about the animals" so that partners can put together a food chain or multiple food chains from the animals in this book.
    - They should record and explain why this is a food chain and how it is important to making a garden thrive. (This recording of ideas can be a writing and a science grade).
- Closure: Write this sentence on the board:
    - Wind whistles through last year's plants, and mud sucks at my rainboots.
    - Have students discuss with a partner what the figurative language is and what the literal meaning is.
    - Then call on a student at random to share.

Decision Matrix Template

1. In the criteria boxes, list the criteria from your design brief.
2. Under the ideas boxes put each group member's ideas–label the sketches A, B, C, D, and E.
3. Evaluate the design idea for each criterion.
    a. For a yes or no response to the criteria, use 1 if the answer is no, 2 if the answer is yes.
    b. When assessing a criterion, use the scale between 1 and 4, 1-2 means it almost or definitely does not meet this criterion, 3-4 means it almost or definitely is the best possible solution to the problem for this specific need.
4. When you finish evaluating your sketches, add the numbers across the row and put your answer in the Total column.
5. The design with the highest total is your Best Solution.

Ideas	**Criteria**						**Totals**
A) Designed by:							
B) Designed by:							
C) Designed by:							
D) Designed by:							
E Designed by:							
Rationale Explain why you chose the design and how it is the best solution to the problem.							

Design Process Rubric

Steps of the Design Process	Exceeds - 4	Proficient - 3	Developing - 2	Emerging - 1	Not Met
Define the Problems W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.	Design brief is completed and includes all required information, including client, designer, problem statement, design statement, constraints and deliverables. Research is documented with appropriate citations. Research shows a variety of resources and is not limited to one or two sources.	Design brief is 80% complete. Research is documented on some topics. One or two do not have proper citation information. Research is limited to two or three resources.	Design brief is 50% complete Research is randomly completed with little documentation of resources. Research is limited to one or two resources.	Design brief is less than 50% complete There is no research other than what is available from lecture notes.	Design brief is not complete There is little or no evidence of research in the notebook.
Generate Concepts SL.5.1a Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.	Evidence of individual brainstorming: detailed plan to solve/address problem. The decision matrix is complete with all criteria listed and each solution evaluated. The student can effectively justify the final decision.	Evidence of individual brainstorming: just a sketch or just notes The decision matrix does not evaluate the required number of drawings. The student can justify the final decision.	Evidence of individual brainstorming is not completely clear, although it is evident an idea exists. The decision matrix criteria are incomplete. The option selected is not clearly justified using the matrix.	Evidence of individual brainstorming is minimal. The decision matrix is missing both criteria and evaluations of drawings. The final project decision cannot be justified using the matrix.	No evidence of individual brainstorming. The decision matrix is excessively incomplete or missing. The final project decision cannot be justified using the matrix.
Design a Solution W.5.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.	Solution plans are complete and annotated to show all important information. Solution is unique and look professional. (Digital models may have been created).	Solution plans are mostly complete but may be missing important information, such as measurements.	Solution plans are missing more than half of the identification of the components.	Solution plan is not complete.	There is little or no evidence of a solution plan.
Build and Test W.5.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.	Step-by-step description of your process, that includes failures and how those failures were overcome. The final product meets all 6 of task constraints.	Process notes explain the building process, but lack specific details The final design meets all 5 of the task constraints.	Process notes describe the build but not the process. The final design meets 3-4 of the task constraints.	The process notes are very general. The final design meets 1-2 of the task constraints.	There is no evidence of design process notes. The final design meets none of the task constraints.
Evaluate Solution SL 5.5: Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.	Group creates a visual that proves their design has effectively met the requirements; includes, but not limited to: Cited evidence, Group's Design Process, Proof that it solves the problem.	Group creates a visual, but it is limited to only the Design Process, and does not include why this is the best design for the problem.	Group creates a visual but is not detailed or focuses on only one area (evidence, Design Process, or how it solves the problem).	Group creates a visual, but includes minimal information or has been sloppily put together.	Group does not create a visual.

Present Solution SL 5.4: Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.	(Group) The presentation effectively and creatively delivers information related to the team's design solution with appropriate visual aids. (Individual) Student speaks with a presentation voice maintains eye contact with audience, relaxed body language- hand gestures support understanding all of the time.	(Group) The presentation adequately and creatively delivers information related to the team's design solution with appropriate visual aids. (Individual) Student speaks with a presentation voice maintains eye contact with audience, relaxed body language- hand gestures support understanding most of the time.	(Group) The presentation adequately delivers information related to the team's design solution with some appropriate visual aids. (Individual) Student mostly speaks with a presentation voice Maintains some eye contact with audience relaxed body language- hand gestures support understanding some of the time.	(Group) The presentation delivers some information related to the team's design solution with few appropriate visual aids. (Individual) Student lacks speaking with a presentation voice, minimal eye contact with audience, nervous body language- hand gestures don't support understanding.	(Group)The presentation inadequately delivers information related to the team's design solution with inappropriate or no visual aids. (Individual) student does not speak during the presentation.
Teamwork & Peer Evaluation SL.5.1a Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. **(Student Friendly Language)**	The student consistently listens to all team members, respects varying opinions, communicates ideas and opinions effectively, and engages in compromise. Group member took a leadership role in the Design Process. Group member included all group participants in the Design Process allowing everyone to help and share ideas along the way.	The student generally listens to team members, respects varying opinions, communicates ideas and opinions effectively, and engages in compromise. Group member was mostly actively engaged in the project although got side tracked on occasion. Students shared ideas and helped to problem solve whenever there was a hurdle in the Design Process. Group member treated other group members with respect.	The student does not always effectively listen to team members or show respect for varying opinions. The student does not always communicate ideas and opinions or engage in compromise. Group member took some responsibility for the work needed to be done throughout the project. Group member may have been off task frequently. Group member may have been argumentative or may not have treated all group members with respect.	The student does not listen to other team members, does not show respect for varying opinions, and does not effectively communicate ideas and opinions or engage in compromise. Group member only helped when directly asked to help. Group member may not have shared ideas during the Generating Concepts step. Group member may have been argumentative or the majority of the time.	The student shows little to no evidence of communication or cooperation. Group Member was rarely in attendance, and when in attendance did not help on the project

Additional Resources:

Resources:	**Explanation of resource:**
https://docs.google.com/presentation/d/1d6Hm1rxoLYDtLCfU-cBM3bbR7J65GH9jmhVCftCJvpI/edit?usp=sharing	Customized Jeopardy Slideshow game for this unit.
Greenourplanet.org	This is a site that has some examples of garden designs, as well as links to get help to make your garden a reality.
BlocksCAD	This is a program that uses blocks coding to create 3D images. It is a free site.
http://agri.nv.gov/Outreach/Ag_Literacy/Resources/	Teachers can request additional resources for extensions on eating healthier, invasive species, and other state related video connections. It said buy, but I found no fees.
https://gethealthyclarkcounty.org/eat-better/community-school-gardens/	A starting point for greater outreach or community links for information and generating ideas.
https://kidsgardening.org/lesson-plans-growing-poems/	Here is an ELA component that could be utilized.
Video (6:57 min) designing a botanical garden https://thefutureschannel.com/videogallery/landscape-architects/	Career Connection There are tours of Bellagio's Garden areas for a local connection.
https://www.agclassroom.org/teacher/ag_facts.cfm https://www.unce.unr.edu/drought/ https://www.agclassroom.org/teacher/matrix/search_result.cfm https://knpr.org/dc-blog/good-time-plant-veggies-southern-nevada https://www.soils4teachers.org/	State information: if you opted to explore other regions to evaluate and compare regions with one another, this will provide agricultural and soil lessons that can be utilized as options, or in compliment with the FOSS kits.