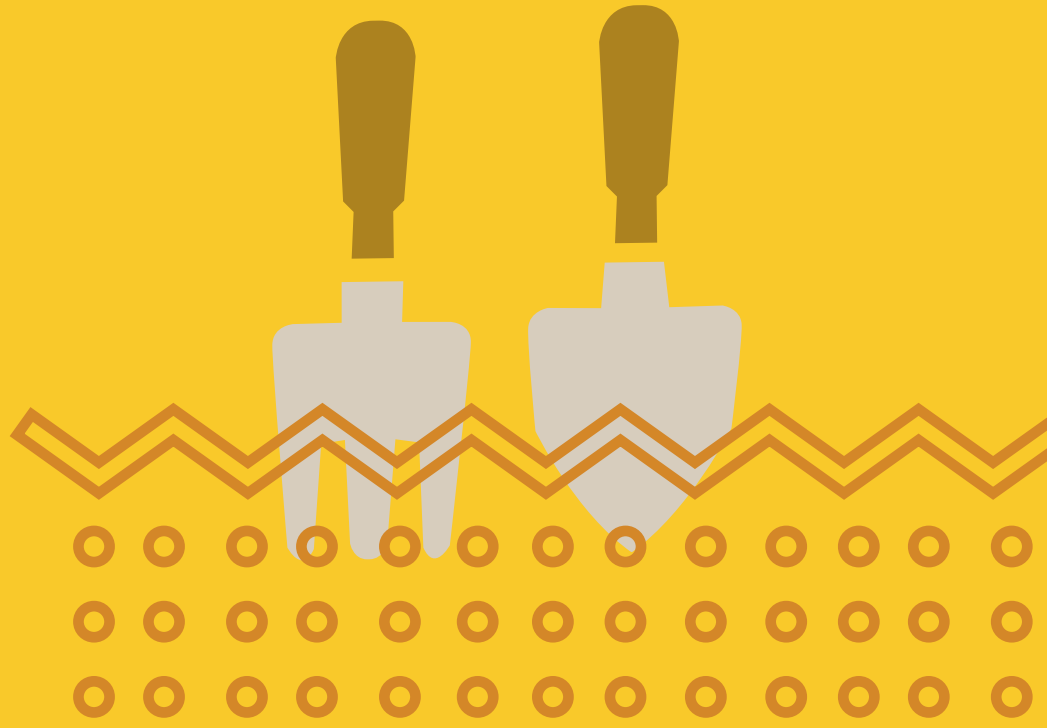
The Outdoor Garden Classroom

Hands-On STEM Teaching Curriculum, Pre-K-5

3

Third Grade Lessons

All About Soil
(2nd Edition)



THE OUTDOOR GARDEN CLASSROOM

Hands-On STEM Teaching Curriculum, Pre K-5

Lessons are to Nevada State and Next Generation Science Standards

Written by: Elaine Bennett, Walter Bracken Steam Academy
Kam Hughes, Sandy Searles Miller Academy for International Studies
Sarah Wagstaff, Garden Farms

Edited by: Ciara Byrne, Jessica Penrod & Cindy Dixon

Designed by: Suzanne Choi & Chris Bruns

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The **American Honda Foundation** helps meet the needs of American society in the areas of youth and scientific education by awarding grants to nonprofits, while strategically assisting communities in deriving long-term benefits. Since 1984, the American Honda Foundation has awarded more than $32 million to organizations serving over 115 million people in every state in the U.S.

Green Our Planet is a nonprofit, 501(c)(3) organization established in 2013. Its mission is to raise money for green projects worldwide via its crowdfunding platform and to educate the public about the most pressing environmental issues facing the planet today. Green Our Planet's overall goal is to help conserve, protect, and improve the environment through funding green projects and through education, which includes STEM, nutrition and conservation education in K-12 schools. In 2013, Green Our Planet launched its "Outdoor Garden Classroom Program" in Las Vegas, Nevada, which is designed to help schools fund and use outdoor vegetable gardens as "hands-on" classrooms. For more information on Green Our Planet and its programs, please visit *www.greenourplanet.org*.

Three Square's mission is to provide wholesome food to hungry people, while passionately pursuing a hunger-free community. Three Square combines food banking (warehousing canned and boxed goods), food rescue (obtaining surplus or unused meats, bread, dairy and produce from hospitality and grocery outlets), and ready-to-eat meals as the most complete food solution for Southern Nevada. Three Square works with more than 1,300 partner sites in the Southern Nevada community. Three Square distributed more than 30 million pounds of food, the equivalent of more than 25 million meals.

Achieving Excellence Through Education. The vision of Clark County, in conjunction with the Clark County School District, is to provide a safe, supportive environment which enables each student to acquire knowledge, skills and values necessary to a lifelong learner and to become a responsible, contributing member of our changing society.

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A NOTE ON THE SECOND (REVISED) EDITION

Since its release in October, 2014, the Outdoor Garden Classroom Hands-On STEM Teaching Curriculum has been used at an increasingly greater number of schools. During the 2014-2015 school year, 63 teachers at 15 CCSD schools provided feedback on their use of the curriculum with their students. The feedback and improvements they suggested were used by five of the original teachers who created the curriculum so that the 2nd edition could be revised and improved. In addition, the curriculum was extended into Pre-K. Further improvements occurred in the summer of 2015 when nutritional facts were added to the lessons for grades 1 through 5. The nutritional facts are aligned to Nevada State Standards and are tied to the information in each science lesson. Also added to this edition are "Brain Breaks" that occur every 15 minutes. These consist of vigorous exercise breaks that are connected to gardening. For example, students might jump up and down while picking imaginary apples from a tree or students might pretend to dig holes in the ground in order to transplant vegetables. Grades 3, 4, and 5 also now have worksheets and a "lesson map" added to them, so that teachers can more easily plan out the teaching of each lesson.

In subsequent years, the OGC curriculum will continue to be revised based on further teacher feedback. In this way, the lessons can continually be improved so that they become a "living curriculum." A special thanks to all of the teachers who contributed to this revised 2nd edition!

TEACHER FEEDBACK—LET US HEAR FROM YOU!

Teacher feedback is welcome—we want to hear from you about your experiences using this curriculum so that the lessons can be continually improved! All feedback can be left at: **lessons.greenourplanet.org**

Click on the tab at top that says " Teacher Feedback."

Teachers and administrators can also contact us directly at:
info@greenourplanet.org

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Third grade students will learn about the different types of soil and the components of soil. Students will learn that different plants prefer to grow in different types of soil. Students will analyze how weather, climate and erosion affect soil and plant growth. Students will reflect on how bees and worms are important for optimal plant health and how their life cycles interact with the life cycle of the garden. Students will learn how to enrich and protect the soil throughout the year. At the end of the year, students learn how to protect the soil and their garden for the hot summer months. To further their inquiry into the garden, teachers and students are encouraged to visit UNLV's Center for Urban Horticulture and Water Conservation, which is a wonderful opportunity for students to reflect upon their learning from their third grade year.

SEPTEMBER | OCTOBER

Lesson 1 - Soil Components
Lesson 2 - Sand, Silt, Clay Oh My!
Lesson 3 - Engineering a Better Soil
Lesson 4 - Plant Growth and Soil type
Lesson 5 - Soil Water Absorption

Objectives

NV Standards: (3)1.1, (3)1.2, (3)1.3, (3)1.4, (3)1.5, (3)1.6, (3)1.7, (3)1.3, (3)3.2
Next Generation Standards: 3-LS3-2, 3-LS4-3, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3

Objectives

Students will engineer a compost bin as well as a worm farm to start the school garden for the year. Students will then inquire into the components of soil and its layers as they collect different soil samples around the school garden. They will use these soil samples to do experiments to test for plant growth within different types of soil. This will lead into how different soils absorb/hold water and how this may affect plant growth.

NOVEMBER | DECEMBER

Lesson 6 - Soil Degradation
Lesson 7 - Soil and Weather
Lesson 8 - Amending the Soil

Objectives

NV Standards: (3)1.1, (3)1.2, (3)1.3, (3)1.4, (3)1.5, (3)1.6, (3)1.7, (3)3.1, (3)3.2, (3)3.3, (3)4.7

Next Generation Standards: 3-LS4-4, 3-ESS2-1, 3-ESS2-2

Overview

Students will inquire into how soil is degraded by many factors including weather, climate, and erosion. Students will make connections from what they learn to what is happening in their own garden and take action into reducing soil degradation in their garden.

JANUARY I FEBRUARY

Lesson 9 - Composting
Lesson 10 - Soil Food Web
Lesson 11 - Components of a Worm
Lesson 12 - Worm Life Cycle

Objectives
NV Standards: (3)1.1, (3)1.2, (3)1.3, (3)1.4, (3)1.5, (3)1.6, (3)1.7, (3)3.1, (3)3.2, (3)3.3, (3)4.2, (3)4.3, (3)4.4, (3)4.5, (3)4.6, (3)4.7
Next Generation Standards: 3-LS1.B, 3-LS4.D

Overview
Students will research the various practices of how to enrich soil for optimal plant growth. Students will compare and contrast healthy soil to unhealthy soil. Students will explore how healthy soil includes many organisms that are imperative to soil health. Students will analyze the soil food web and that will segue to the life cycle of the worm. Teachers are strongly encouraged to utilize Desert Research Institute's (DRI) ready- made soil classroom teaching modules (known as "Green Boxes") to enrich their students' knowledge.

MARCH I APRIL

Lesson 13 - Plant Life Cycle
Lesson 14 - Bee Life Cycle
Lesson 15 - Pollination
Lesson 16 - Building Bee Boxest

Objectives
NV Standards: (3)1.1, (3)1.2, (3)1.3, (3)1.4, (3)1.5, (3)1.6, (3)1.7, (3)4.4, (3)4.5, (3)4.6, (3)4.7
Next Gen Standards: 3-LS1, 3-LS3-1

Overview
Students begin to look into how insects, such as bees, help pollinate flowering plants. Students learn how to increase the bee population around their garden to help keep plants propagating.

MAY

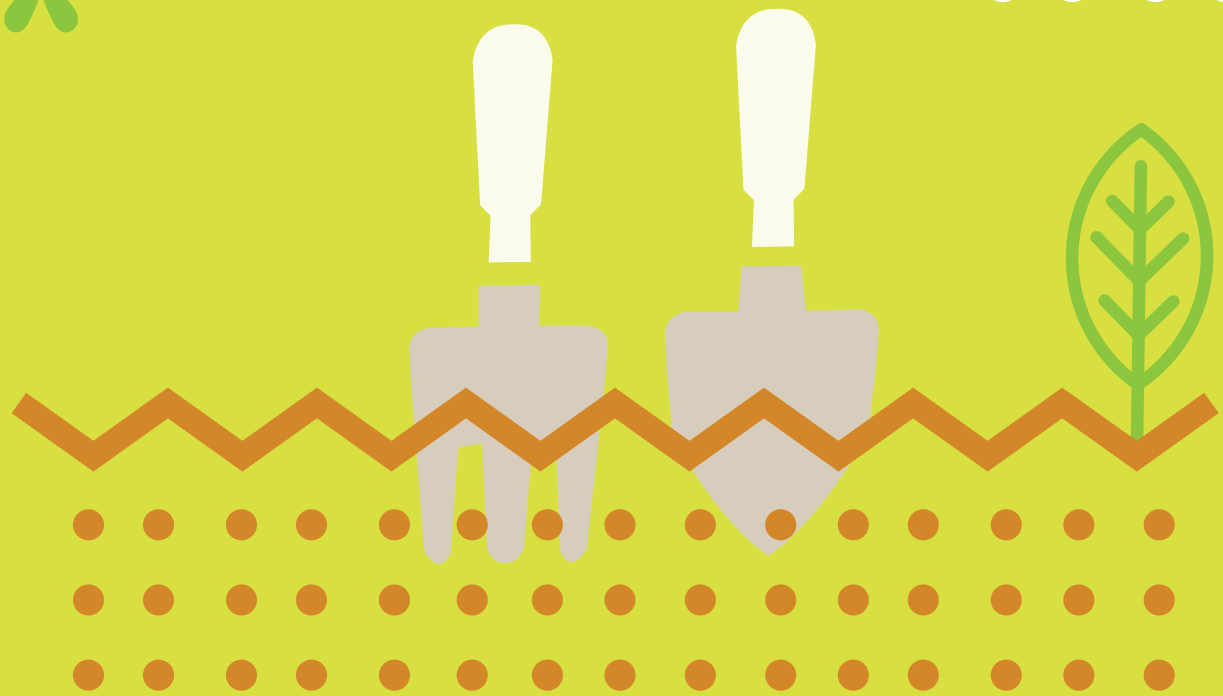
Lesson 17 – Making Mulch for the Garden

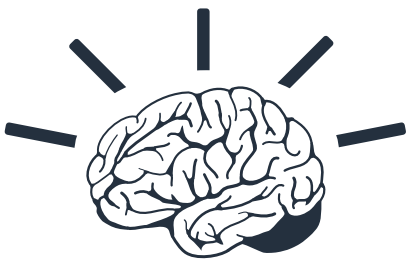
Objectives
NV Standards: (3)1.4, (3)1.5, (3)1.6, (3)1.7
Next Gen Standards: 3-ESS3.B

Overview
Students learn the importance of mulching to prepare for the hot summer months. Students learn how to make mulch using leftover materials. Teachers are encouraged to conduct a field trip to the UNLV Center for Urban Horticulture and Water Conservation. This field trip is a good culmination of all concepts discussed throughout the year.

Lesson One

Soil Collection and Components





BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students will collect and examine different types of soil.

OBJECTIVE

- Students will describe what they know about soil.
- Students collect, examine, compare and contrast soil from different locations.

STANDARD

Nevada Standards

NV (3)3.1 Investigate and describe that the Earth is composed of different kinds of materials (rocks, soil, water, air).

NV (3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

Next Generation Science Standards

3-LS3-1: Science and Engineering Practices
Next Generation Science and Engineering Practices:
Analyzing and Interpreting Data: *Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing qualitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning.*

TEACHER INFORMATION

Soil is a miraculous thing. Soil provides support, moisture and nutrients for plants. At least 70% of gardening problems are attributed to poor soil. Soil is made up of minerals, organic matter (humus: decayed living matter) and many living creatures. In a healthy soil there are more living things than all the human beings ever born. See www.soilfoodweb.com for more information on the life in soil. Think of soil as a thin living skin that covers the earth.

TIME

Approximately 60 minutes

QUESTIONS

- What is soil?
- What is soil made up of?
- Are all soils alike?

- Why are there different types of soil?
- Is soil important?
- How does soil change from one place to another?

MATERIALS

- Teacher display KWL Chart (See at the end of this lesson)
- Sandwich Bags - 1 per student
- Sharpie Marker - 1 per group
- Soil/Dirt
- Paper Plates - 1 per student
- Popsicle Sticks for separating samples - 1 per student
- Magnifying Glasses - 1 per student
- Science Journals

PROCEDURE

1. Students and teachers complete KWL Chart on projection board and save for future use. Discuss and record what students know about soil. Record student questions.
2. Give each student a sandwich bag and group students in groups of 4. Students look around the school grounds for four different soil samples. Students label the location of the sample on each bag.
3. Students return to class and sit in groups. Teacher guides students in a whole group activity of examining soil samples. Teacher models how to: pour sample on paper plate, observe and separate soil using tools, record properties (using 5 senses) and observations (characteristics), and draw diagram in journal labeling and listing properties.
4. Each student observes their sample, records properties and observations, and draws diagram in journal.
    a. Students can use colored pencils to highlight the different properties in the soil samples.
5. Students and teacher discuss soil components and what they see in their samples.
6. Students share journal entries in small groups.
7. Revisit KWL Chart filling in what is learned so far.

ASSESSMENT

Student journal entries, discussions, KWL chart

ADAPTATION

- Use iPad or camera to record student notes, print and share among group members.
- Students can research components of soil using the Internet. Students can take soil samples at home, bring to school and compare and contrast with school samples.

DIGGING DEEPER

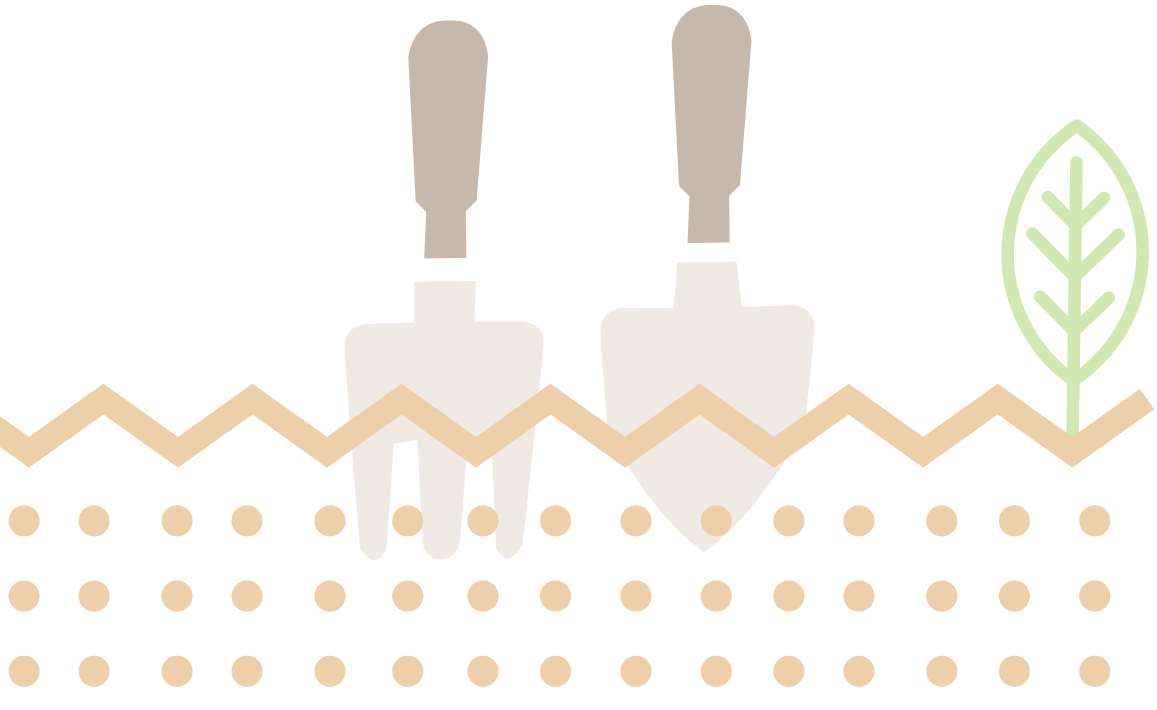
- Have students collect soil near their homes to learn how it compares to the soil around the school. Ask them to list similarities and differences.
- Have students listen to the Banana Slug Gang's song 'Dirt Made My Lunch.' What do the lyrics mean to them?
- Study the different soil taxonomies in Las Vegas.

DID YOU KNOW?

- You can learn much about the soil in your area by studying local geography and observing the natural features around you. Your native soil may contain bits and pieces of nearby mountains, ancient sand dunes, and historical riverbed rock.
- There are approximately 140 different soil profiles in the Las Vegas Valley alone!
- Soils are classified in the same manner that plants and animals are classified; it's called 'soil taxonomy'.

NUTRITION FACTS

- Plants get important growth nutrients needed for survival from the soil; there are 13 mineral nutrients that come from soil.

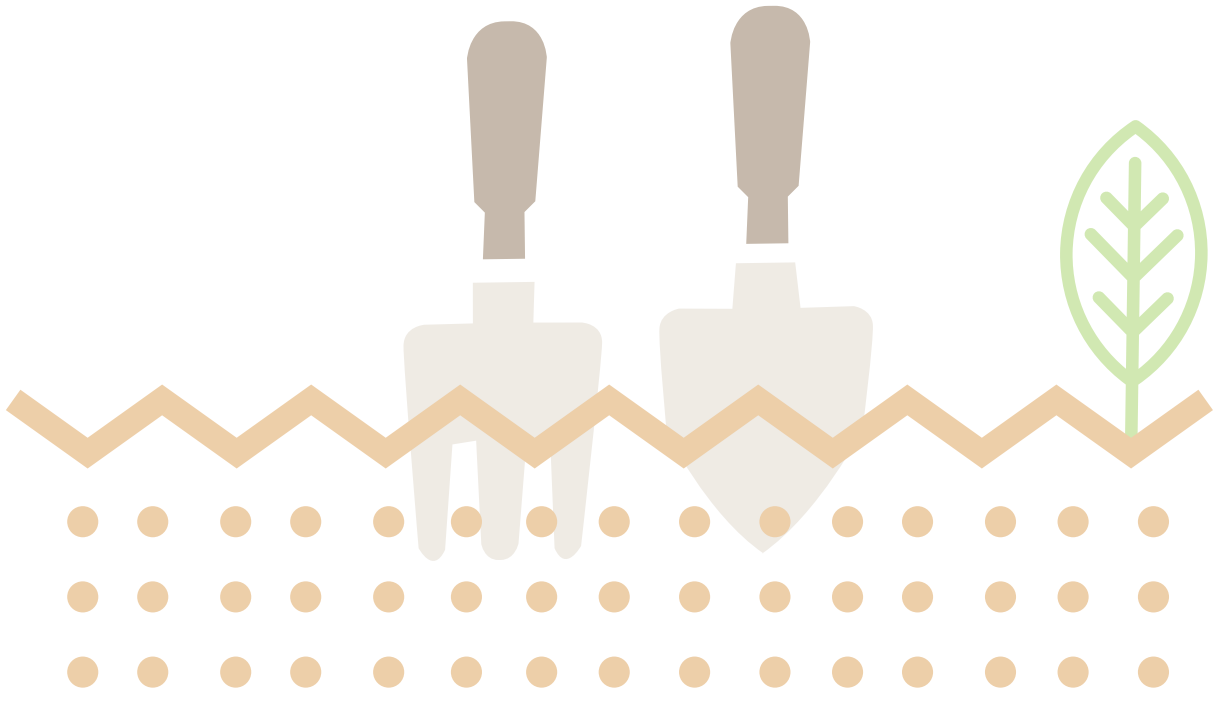


SOIL KWL CHART

Write on the board 3 colums:

What do we Know? **What do we want to learn?** **What have we Learned?**

Teacher can have a whole group discussion starting with “What do we know?” Teacher then asks the question, “What do we want to learn?” This is a great opportunity for teachers/students to start with their knowledge base and then to add to their knowledge with questions they have created. Finally, when the lesson is over the teacher can ask students to fill out the column “What have we learned?” as a recap to the lesson.



STANDARDS FOR LESSON 1 LESSON MAP

NG:3-LS3.1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

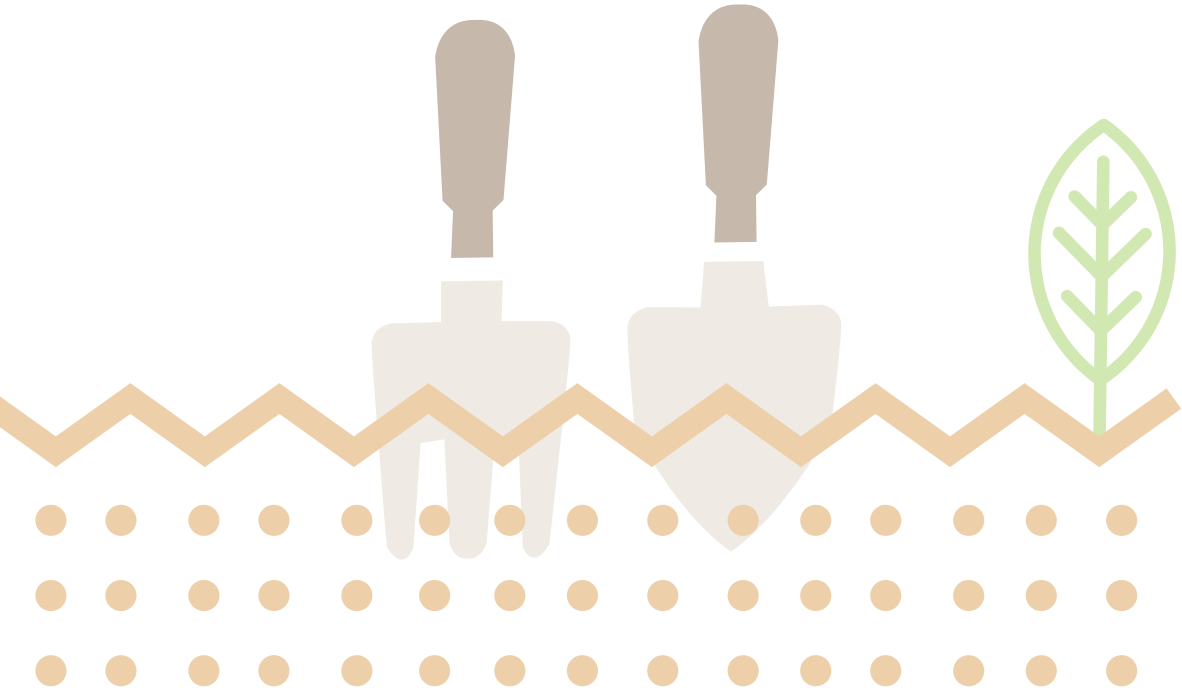
Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

SL 3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

Math 3.NBT.A.1 Use place value understanding to round whole numbers to the nearest 10 or 100.

3.NBT.A.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units – whole numbers, halves, or quarters.



LESSON 1 LESSON MAP

Lesson 1: Soil Collection and Components

Day 1: Preview

- 5 senses
- Scientific Observation
- KWL Soil

Day 2

- Collect soil samples

Day 3

- Venn Diagram Soil VS Dirt

Garden Observation

- Observe and describe soil samples

Day(s) 2

Math

Rounding to the 10s/100s

Addition and Subtraction within 1000s (microbes in a tablespoons of soil)

Day(s) ____

GLL

Listen to song *Dirt Made My Lunch*

Literary Elements

Literacy connection

Day(s) ____

Science/Social Studies

Extension Garden Observation

Name:_____

Date: _____

SOIL KWL CHART

What do you already know about soil? What do you want to know about soil?
What did you learn about soil?

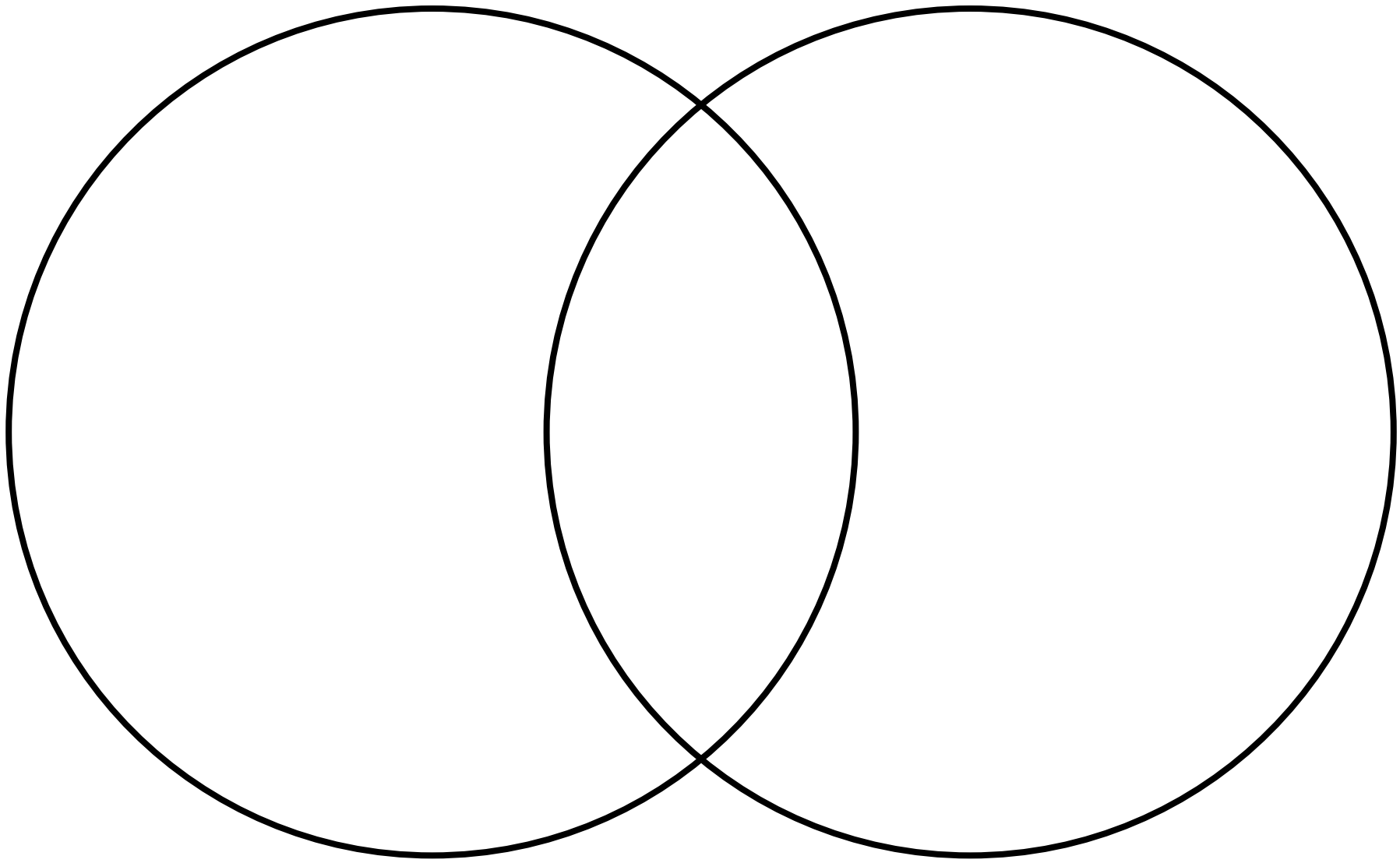
KNOW	WANT TO KNOW	LEARNED

Name:_____

Date: _____

SOIL VS. DIRT VENN DIAGRAM

Directions Write Soil in one circle and Dirt in the other circle. Write down all of the things soil and dirt have in common in the middle part of the circle. Write what they do not have in common in the outer part of the circle.



Name:_____

Date: _____

SOIL ROUNDING

1. There are approximately 140 different soil profiles found in the Las Vegas Valley alone! Rounding to the nearest hundred, about how many different soil profiles are there?

A: _____

2. There are 80 types of soil found in the school gardens across Las Vegas. Rounding to the nearest hundred about how many types of soil have been found?

A: _____

3. In the garden, there are 270 worms. Rounding to the nearest hundred. About how many worms are found in the garden?

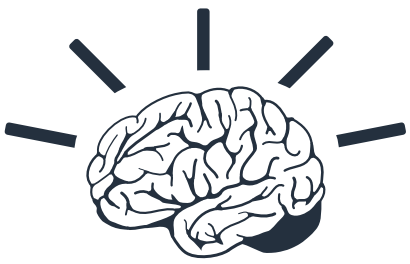
A: _____

4. In the school garden soil, Mr. Ortiz found 510 seeds. Rounding to the nearest hundred about how many seeds did Mr. Ortiz find?

A: _____

Lesson Two

Sand, Silt, Clay, Oh My!



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OVERVIEW

Students will examine the components of soil using the “jar test”.

OBJECTIVE

- Students will mix water and soil in a jar, comparing the layers of sand, silt, and clay.
- Students will record observations in their science journals by using diagrams and labels.
- Students will be able to identify soil components orally and in written form.

STANDARD

Nevada Standards

NV (3)3.1 Investigate and describe that the earth is composed of different kinds of materials (rocks, soil, water, air).

NV (3)3.2 Compare, test, measure, record, and describe observable properties of rocks and minerals.

NV (3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

Next Generation Science Standards

3-LS3-1: *Science and Engineering Practices*
Analyzing and Interpreting Data: *Analyzing data in 3-5 builds on Pre K-2 experiences and progresses to introducing qualitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning.*

TEACHER INFORMATION

Soil is a natural material occurring in a wide variety all over the Earth. The basic components of soil are: solid, liquid and gas. Approximately 50% of soil is a mixture of solid matter made up of mineral (rocks) and organic matter. The particle sizes of the minerals in the soil help to determine the ‘texture’ of the soil. The three particles (from largest to smallest) are: sand, silt and clay. Sandy soil tends not to hold water due to the fact that the sizes of the sand particles are large, creating large spaces between the particles. Imagine a large beach ball, if you will, to represent a particle of sand. Silt particles are smaller than sand, but larger than clay. Silt particles are similar to the size and shape of a Frisbee. The smallest particles are clay particles, similar to the size and shape of a dime. Most soils are a combination of the three different particles in varying percentages. To find out what particular type of soil you have, a simple soil jar test can be done. Once a sample of soil is collected and placed in a jar, you would add water, place the lid on the jar and shake.

Allow the soil to 'settle' overnight. The heavier sand will be on the bottom of the jar, followed by the silt, then the clay, water and finally the organic matter will be floating on top of the water. This is a quick and fun way to see what the predominant makeup of your soil is.

TIME

Day 1 - 60 minutes | Day 2 - 45 minutes

QUESTIONS

- What are the components of soil?
- Why is it important that there are different things in the soil?
- What are the different things that are in the soil?

MATERIALS

For the Class

- Jar of water with lid
- Soil samples from previous lesson
- Newspaper

For Each Student

- 1-liter (or 1-quart) jar with lid: all jars should be the same shape with clear, straight sides.
- 750 mL (or about 3 cups of water)
- Soil sample from previous lesson
- Paper funnel
- Masking tape label
- Marking pen
- Scoop or large spoon

For the Teacher Control Specimen

- 1-liter (or 1-quart) jar with lid: all jars should be the same shape with clear, straight sides.
- 750 mL (or about 3 cups of water)
- 3 cups of equal parts sand, silt, clay and organic material
- Paper funnel
- Masking tape label
- Marking pen
- Scoop or large spoon

PROCEDURE

Day One

Preassessment: Arrange students in groups. Ask students the lesson questions and have them write their thoughts with supporting answers in their science journals. Students will share their thoughts within their groups.

1. Teacher will discuss the activity and students will write their tasks in order to remember and self-manage their time. Encourage groups to predict what will happen when they shake their jar filled with soil and the contents settle. Students should write their predictions in their journals.

2. Teacher will demonstrate (using control specimen) how to label the jar and correctly fill the jar to the tape mark, using a spoon and paper funnel. Teacher will show students how to safely shake jars, holding both the top and bottom.

* How to label the jar: Using masking tape, mark on each side of the jar the level to which the soil should be added (about 1 1/2 cups). At the 3 1/2 cup level, place another strip of masking tape to indicate the level for water.

3. Have students create their soil jars. Jars should be labeled with student names.

4. Have students diagram in their journals their unshaken jars.

5. Have students shake their jars. After five minutes, call time and have students quietly watch their jar for approximately one minute.

6. Move the jars to an area where they will be undisturbed for a day.

Day Two

1. Have students observe their jar. Students will draw a diagram of their jar with observable layers.

2. Teacher and students observe and discuss teacher control specimen.

3. Have a class discussion about the layers. Have students discuss the purpose of each layer. Students will revisit their drawing and add labels with the parts' purposes.

4. Have students revisit their lesson questions and record any thoughts that may have changed due to the lesson; students should support their answers with details.

ASSESSMENT

Students provide answers to the lesson questions in their science journals. Answers must have supportive information.

ADAPTATIONS

- Use an iPad or any other form of technology to take a picture of the jar. Students can also record their information using technological software and share their information.
- Students will use a soil sample from home to separate, observe and identify its properties.

DIGGING DEEPER

- Have students try the jar test at home using soil from a garden or houseplant. Compare this to soil from the open desert.
- Calculate percentages using the results of the jar test.
- Make popcorn balls in class to show soil crumb structure.

DID YOU KNOW?

- Soil particles are defined by their size. Gravel measures up to 75 millimeters wide, roughly the size of a lemon. A particle of sand is up to 2 mm across, a little wider than the side of a coin. Clay measures less than .002 mm wide, which is much thinner than a single strand of human hair!
- Soil is alive, in fact, in 1 teaspoon of healthy soil there are between 100 million and 1 billion bacteria alone!

GARDENER'S TIP

- You can learn much about the soil in your area by studying local geography and observing the natural features around you. Your native soil may contain bits and pieces of nearby mountains, ancient sand dunes, and historical riverbed rock.

NUTRITION FACTS

- The 13 mineral nutrients are broken into 2 groups: macronutrients and micronutrients. (Just like the human diet!)

STANDARDS FOR LESSON 2 LESSON MAP

NG:3-LS3.1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5 x 7.

3. MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units-whole numbers, halves or quarters.

LESSON 2 LESSON MAP

Lesson 2: Sand, Silt, Clay, Oh My!

Day 1

- Pre-assessment
- Introduce lesson questions
- Journal writing answering the questions
- Predictions

Day 2

- Teacher models creating jar and labeling
- Students create their soil jars and label with student names

Day 3

- Students diagram their unshaken jars
- Shake jars, observation
- Move jars to be undisturbed for a day

Day 4

- Observe jar/diagram jar
- Class discussion of layers and purpose of each layer
- Add labels to their drawing

Day 5

- Mini-lesson on measurement
- Revisit their questions and record how answers have changed
- Assessment

Outdoor Garden Day

- Students observe soil in our garden.
- Make observations and record findings.

Day(s) 2

Math

Rounding to the 10s/100s

Addition and Subtraction within 1000s (microbes in a tablespoons of soil)

Day(s) ____

GLL

Listen to song *Dirt Made My Lunch*

Literary Elements

Literacy connection

Day(s) ____

Science/Social Studies
Extension Garden Observation

Name:_____

Date: _____

LESSON 2: PRE-ASSESSMENT QUESTIONS

1. What are the components of soil?

2. Why is it important that there are different things in the soil?

3. What are the different things that are in the soil?

Name:_____

Date: _____

LESSON 2: POST-ASSESSMENT QUESTIONS

1. What are the components of soil?

2. Why is it important that there are different things in the soil?

3. What are the different things that are in the soil?

Name:_____

Date: _____

MEASURING ITEMS FOUND IN THE GARDEN

Directions: Measure the following items to the nearest millimeter.

1. A leaf found in the garden

_____ mm

2. A piece of fruit

_____ mm

3. A stick or branch

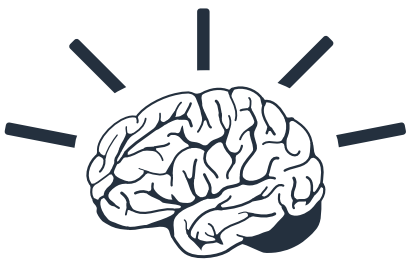
_____ mm

4. A vegetable

_____ mm

Lesson Three

Engineering a Better Soil



BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students will use the engineer design process to improve soil by investigating different methods of composting.

OBJECTIVE

- Students will present research and discuss ways to enrich existing soil at the school for optimum plant growth.
- Students will discuss materials, cost, and feasibility.
- Students will discuss composting and worm composting (vermicomposting).
- Students will engineer compost and/or vermicomposting containers using the engineering design process.

STANDARD

Nevada Standards

NV (3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV (3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

Next Generation Science Standards

3-LS3 Science and Engineering Practices

Analyzing and Interpreting Data: *Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing qualitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning.*

Constructing Explanations and Design Solutions: *Constructing explanations and design solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence to support an explanation.*

3-5-ETS1 Engineering Design

3-5-ETS1-1: *Define a simple design problem reflecting a need or a want that includes specific 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.*

TEACHER INFORMATION

Soil is more than something to walk on. It provides plants support, moisture and nutrients. More than 70% of gardening problems are attributed to poor soil. The entire basis of gardening depends on the quality of the soil you use. Healthy soil will support healthy plants. There are some ways to amend the soil, two of which are compost and vermicomposting. **Compost** is the natural breakdown of plant and animal material by microbial decay into rich black **humus** (the dark organic material in soils, produced by the decomposition of vegetable or animal matter and essential to the fertility of the Earth. **Vermicomposting** is the breakdown of plant and animal material using worms, in other words, "composting with worms." Healthy soil will support healthy plants as well as help the plants resist pests and diseases.

For more information on vermicomposting and how to build your own worm bin, read this excerpt from an excellent book on gardening and home economics:

Making It: Radical Home Ec for a Post-Consumer World *by Kelly Coyne and Erik Knutzen (Rodale, 2010)*

Read more: http://www.motherearthnews.com/diy/make-worm-bin-ze0z11zhir.aspx#ixzz37U14Pjht

This is a great video that demonstrates how to build 4 different types of compost bins from easy to find materials: http://www.treehugger.com/lawn-garden/4-diy-compost-bins-you-can-build-one-day-video.html

TIME

Approximately 4 - 50 minute sessions

QUESTIONS

- How can soil be improved/enriched?
- What is composting?
- What is vermicomposting?
- What are some ways that soil is enriched/amended around the world?
- How can we find information about soil enrichment?
- What are the benefits of composting at home? In a city? In a state?

MATERIALS

- Science Journals
- Internet for research
- Various materials students might need (subject to availability and cost)

PROCEDURE

- Day One

1. Students research ways to enrich soil using the questions listed above.
2. Students present ways to enrich soil based on their research.
3. Students discuss and compare cost, materials and ease associated with each method of soil enrichment.
4. Students narrow down the list of possible ways to enrich soil at the school.
5. Students record information in science journal.

- Day Two

1. Students choose ways to enrich soil (compost bin, “worm farm”).
2. Students work in groups to design tools/method for enrichment (see Engineering Design Process).
3. Students discuss materials and create list.
4. Students record information in science journal.
5. Students collect materials from home, school, etc.

- Day Three

1. Students engineer their chosen product.

- Day Four

1. Students present design to the class.

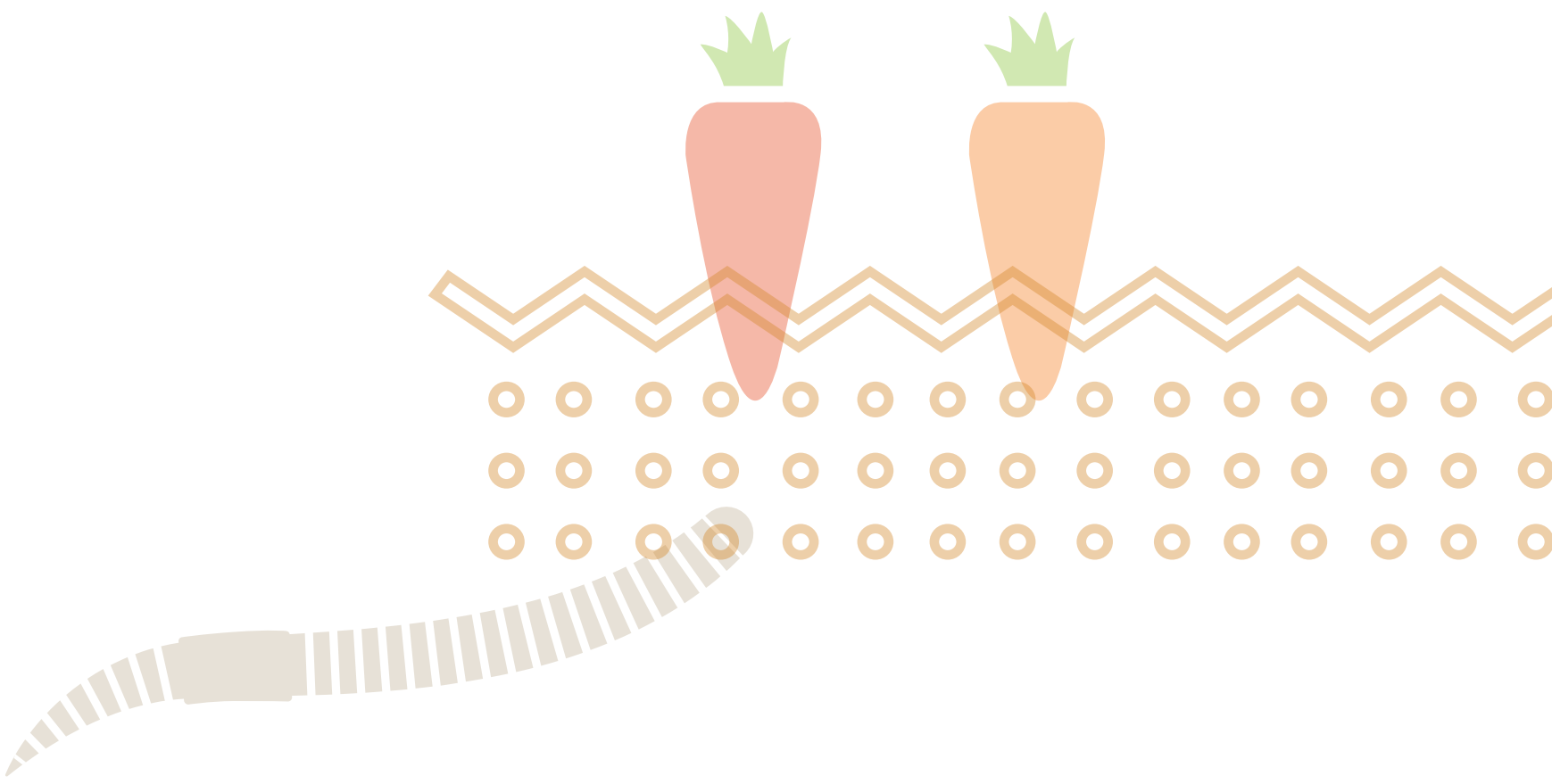
2. Students begin using the tools they designed to enrich soil in the school gardens (testing design and rebuilding when and if appropriate).

ASSESSMENT

Journal entries, discussions, research, models

ADAPTATIONS

- Group students based on various ability levels and needs. Have students watch the video, The Process of Composting, prior to the lesson. (DiscoveryEducation.com video streaming)
- Watch this animation called, *How Compost is Made*, found on YouTube. https://www.youtube.com/watch?v=cBkBwVFFEWw
- Have students create a brochure stating the pros of composting and/or vermicomposting. Have students create a poster of what can be added to a compost bin.



DIGGING DEEPER

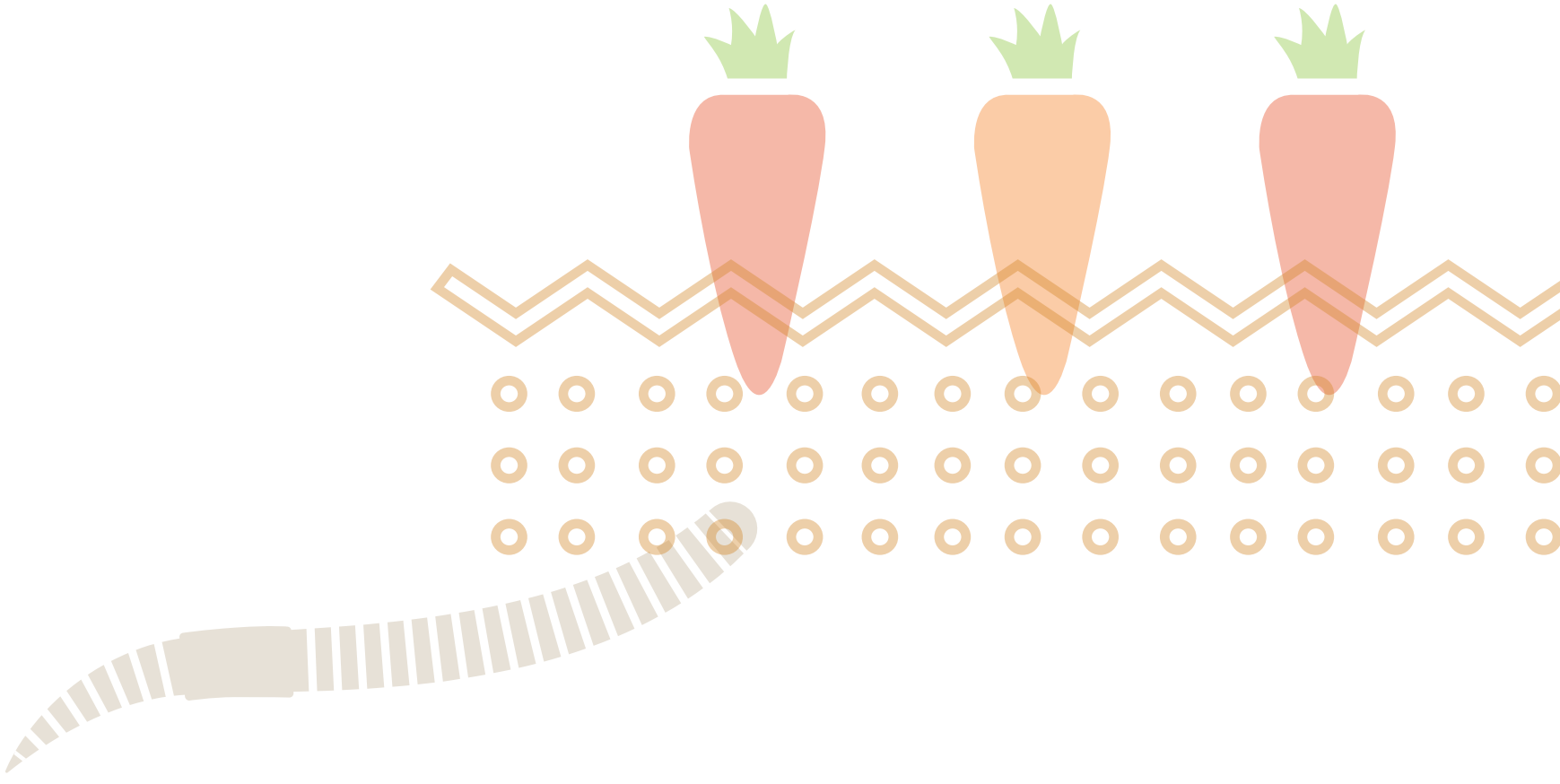
- Have students keep a log of things they throw away for one day. Ask them to research each item to learn if it is compostable.
- All kinds of containers can be used for compost. Have students identify possible compost containers they find in the next week. Creative thinking encouraged!
- Study why the ratio of green:brown materials makes a difference in the compost.
  Green: grass clippings, fruits, vegetables, soft prunings (twigs), coffee grounds
  Brown: dried leaves, pine needles, sawdust, shredded newspaper, straw, wood chips
- Study the different types of composting (advantages/disadvantages):
  Hot Method, Cool Method, Vermicomposting, Bokashi

DID YOU KNOW?

- Some things that should not be added to compost are meats, bones, cooking grease, oily foods, dairy products (in large amounts,) weeds that have gone to seed, dog and cat waste, and glossy magazines.
- The average Las Vegas resident contributes 3000 pounds of garbage to the landfill each year. That means we create 213 pounds of garbage every second.
- About 40% of the garbage we throw away is recyclable.

NUTRITION FACTS

- Plants need to absorb macronutrients and micronutrients through the soil, just like humans do through their diet, to promote growth and development, and regulate function processes.



Name:_____

Date: _____

ENGINEER DESIGN PROCESS

Directions: Use the NASA Engineer Design Process to help you to solve the given problem.

STEP 1: IDENTIFY THE PROBLEM

In your own words, state the problem you are trying to solve.
Example: How can I design a _____ that will _____?

STEP 2: IDENTIFY CRITERIA AND CONSTRAINTS

In your own words, what are the specific design requirements needed? Below list the limits on the design based on available resources and environment.

STEP 3: BRAINSTORM POSSIBLE SOLUTIONS

Each group member should sketch their idea below as the group discusses possible solutions. Labels and arrows should be used to identify parts and how they will move. These drawings should be quick and brief.

STEP 4

Each group member should develop two or three more ideas at a deeper level. You may create new drawings that are orthographic (multiple views showing the top, front. and side) and isometric (three-dimensional depiction). These are to be neatly drawn on separate pieces of paper, using rulers to draw straight lines and to make parts proportional. Parts and measurements should be labeled clearly. Attach these drawings when completed.

STEP 5

The developed ideas should be shared and discussed among the team members. Record the pros and cons of each design directly on the paper next to the drawings. Below, write down notes for each idea.

PROS	CONS

STEP 6 SELECT AN APPROACH

Teams will work together to identify the design that appears to solve the problem best. Below, write your statement that describes why your team chose this solution. Be sure to reference the criteria and constraints listed above.

STEP 7: BUILD MODEL OR PROTOTYPE

Each team will construct a full size or scale model based on their drawings. Below, list materials and tools needed for construction.

STEP 8

Examine and evaluate your prototype or design based on the criteria and constraints. Use feedback from other groups to help identify changes that need to be made. Based on criteria and constraints, teams must identify any problems and proposed solutions. Use the space below to record feedback and solutions.

STANDARDS FOR LESSON 3 LESSON MAP

NG:3-LS3.1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

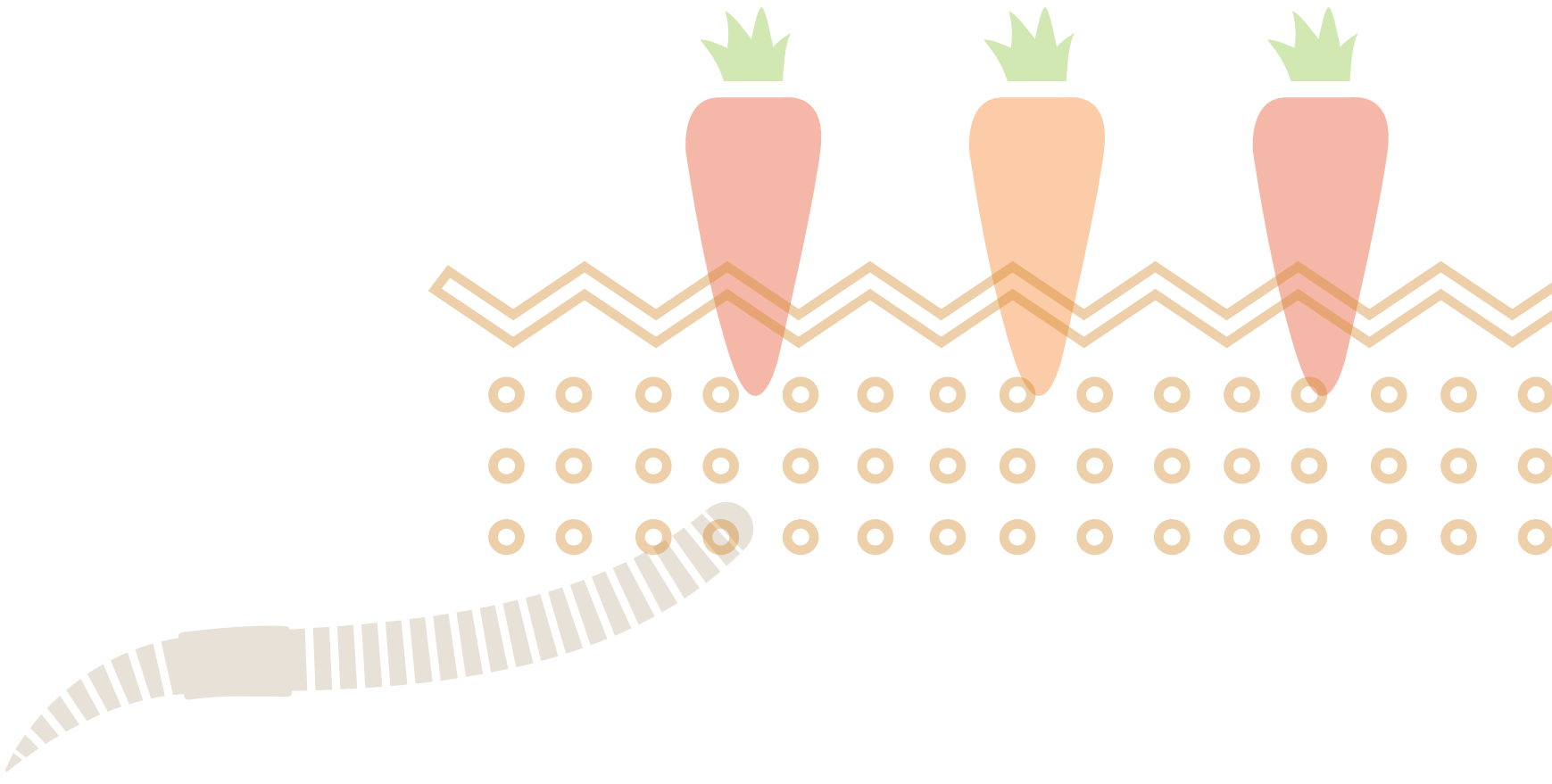
RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

SL3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

Math 3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5 x 7.

3. MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units-whole numbers, halves or quarters.



LESSON 3 LESSON MAP

Lesson 3: Engineering a Better Soil

Day 1

- Preview on how to Compost
- Research ways to enrich soil using given questions
- Present ways to enrich soil based on their research

Day 2

- Students discuss and compare costs, materials for soil enrichment.
- Narrow down ways to enrich soil at school.
- Record info in science journal

Day 3

- Students choose ways to enrich soil.
- Students work in groups to design tools/method for enrichment (see Engineering Design Process).
- Students discuss materials and create list.
- Students record information in science journal.
- Students bring back materials

Day 4

- Students engineer their products

Day 5

- Students continue engineering their products

Day 6

- Students present designs to class and begin creating their composting jars.

Day(s) 2

Math

Multiplication Arrays

Division Soil Observation

Day(s) _____

GLL

Literary Elements

Literacy connection

There's a Hair in My Dirt! A Worm's Story *by Gary Larson*

Day(s) _____

Science/Social Studies Extension

Garden Observation

Composting Bins

Name:_____

Date: _____

ENGINEERING A BETTER SOIL QUESTION SHEET

Answer the following questions using complete sentences as you learn more about soil.

1. How can soil be improved/enriched?

2. What is composting?

3. What is vermicomposting?

4. What are some ways that soil is enriched/amended around the world?

5. How can we find information about soil enrichment?

Name:_____

Date: _____

COMPOST BIN DESIGN SHEET

Create your design for your own compost bin on this paper.

Materials Needed:

Compost Bin Design:

Name:_____

Date: _____

CREATING ARRAYS IN THE GARDEN

Directions: Solve the multiplication problem and create an array with pictures to go with the problem.

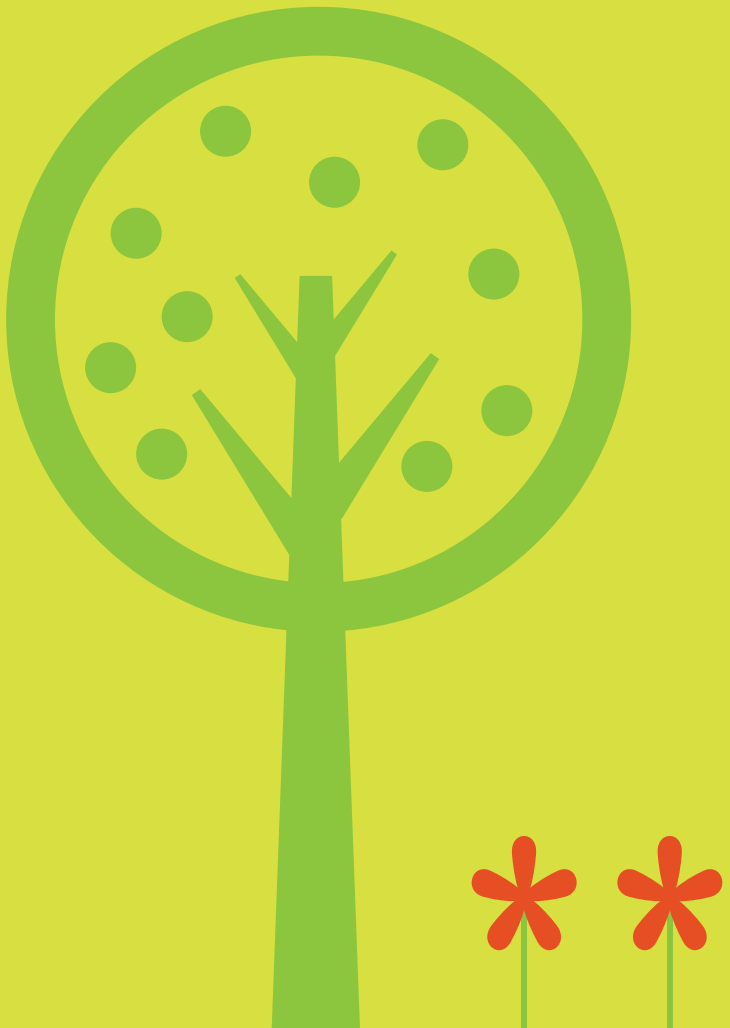
1. Solve 5 x 3 = _____
   There are 5 rows of carrots with 3 carrots in each row. How many carrots are there all together? Draw an array to show your work.

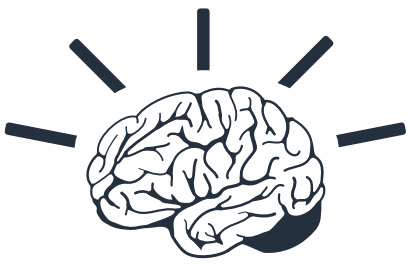
2. Solve 3 x 7 = _____
   There are 3 rows of turnips with 7 turnips in each row. How many carrots are there all together? Draw an array to show your work.

3. Solve 6 x 4 = _____
   There are 6 rows of lettuce with 4 heads of lettuce in each row. How many carrots are there all together? Draw an array to show your work.

Lesson Four

Plant Growth and Soil Type





BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students will conduct a scientific experiment to determine if soil type affects plant growth. They will plant seeds in the soil they collected and predict how well the seeds will grow in that soil type.

OBJECTIVE

- Students will conduct a scientific experiment to determine if soil type affects plant growth.
- Students will record observations in a science journal.
- Students will draw conclusions based on their recorded observations.

STANDARD

Nevada Standards

NV(3)1.1 Identify, gather and safely use tools and materials needed in investigations.

NV(3)1.3 Conduct investigations based on observations and questions raised about the world.

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)3.1 Investigate and describe that the earth is composed of different kinds of materials (rocks, soil, water, air).

NV(3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

NV(3)4.4 Identify and compare needs common to most living things.

NV(3)4.6 Investigate and describe how changes to an environment can be beneficial or harmful to plants and animals.

Next Generation Science Standards

3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment (soil type).

3-LS3 Science and Engineering Practices

Analyzing and Interpreting Data: Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing qualitative approaches to collecting data and conducting mutltiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning.

Constructing Explanations and Design Solutions: Constructing explanations and design solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence to support an explanation.

TEACHER INFORMATION

Depending on where one lives, the soil can range from a dry, sandy soil to a heavy, wet clay soil. Different plants have different soil requirements. The best example would be to look at a cactus and a banana tree. Each one has a completely different requirement for the type of soil they need in order to thrive. The cactus prefers soils that drain quicker than the banana tree.

A typical rule of thumb about how deep into the soil a seed is planted: "Look at the seed, notice the size of the seed, plant the seed as deep as the seed is." In other words, lettuce seeds are very small (almost like poppy seeds). You would just lay the seeds on the surface of the soil, then sprinkle a fine layer of soil over the seeds, then mist with water. A pea seed is about ¼ of an inch in size; plant a pea seed ¼ of an inch below the surface of the soil.

TIME

Approximately 2 weeks

QUESTIONS

- Why is soil important to plant growth?
- How will plants grow better in different types of soil?
- What type of soil do plants grow best in?

MATERIALS

- Soil from previous lessons (Examining the Components of Soil)
- Red solo cups (with holes in the bottom) - 1 per student
- Measuring cup(s)
- Water
- Radish or Sunflower Seeds
- Science Journals

PROCEDURE

1. Teacher models how to plant seeds.
2. Students pour soil into red solo cups.
3. Students place seeds in a hole as deep as the seed is wide.
4. Students water plants with ½ cup tap water.
5. All students place the plants in the same outdoor space.

6. Students predict how well they think their plants will grow and why. Students will record their prediction in their science journals.

7. Students check plants every 2 days, measuring plant growth and recording observations and measurements.

8. Students water their plants each day with ¼ cup of tap water.

9. After approximately 2 weeks, students make their final observation and reflect on their predictions. Students will review their journal entries and draw conclusions about their plants' growth based on the soil type.

10. Students will compare their plant growth and type of soil with the other students plant growth. They will deduce which soil type suits the plants best.

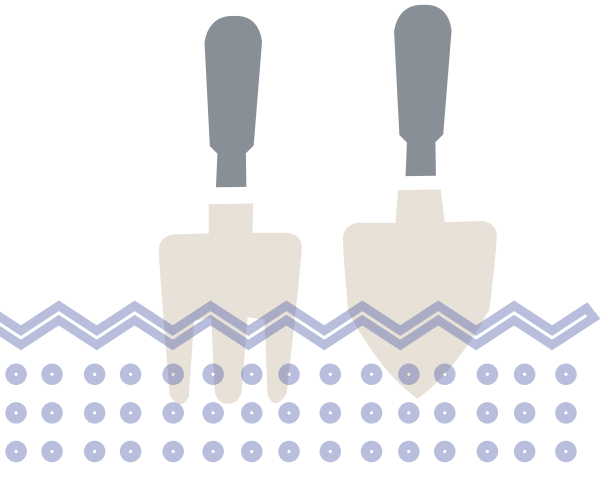
ASSESSMENT

Students reflect on the questions posed at the beginning of the lesson and provide supportive information to their answer in their science journals. After recording answers in their journals, the class will discuss their thoughts.

Throughout the lesson, students will constantly review their journal entries. They will compare their graphs of the height of the plant and discuss specific observations pertaining to properties such as plant color, plant texture, plant smell, etc. Students will make connections amongst the information, form predictions, and draw conclusions based on their entries.

ADAPTATIONS

- Students may use an iPad or any other form of technology to take pictures of their plant after each journal entry and print/paste their picture in the journals. Students can also record their information using technological software.
- Students conduct research about plants from around the world and determine what types of soil are best for that type of plant based on the information they gained from this lesson.
- To help extend this lesson, students can try to grow plants hydroponically and determine the types of nutrients needed to ensure optimal plant growth.



DIGGING DEEPER

- Have students observe any plant displays they come across in daily life. They may find plants at the grocery store, at gatherings and events, and at friends' and family members' houses, especially around holidays. Ask them to get up close and observe the differences in the soil among various potted plants.

DID YOU KNOW?

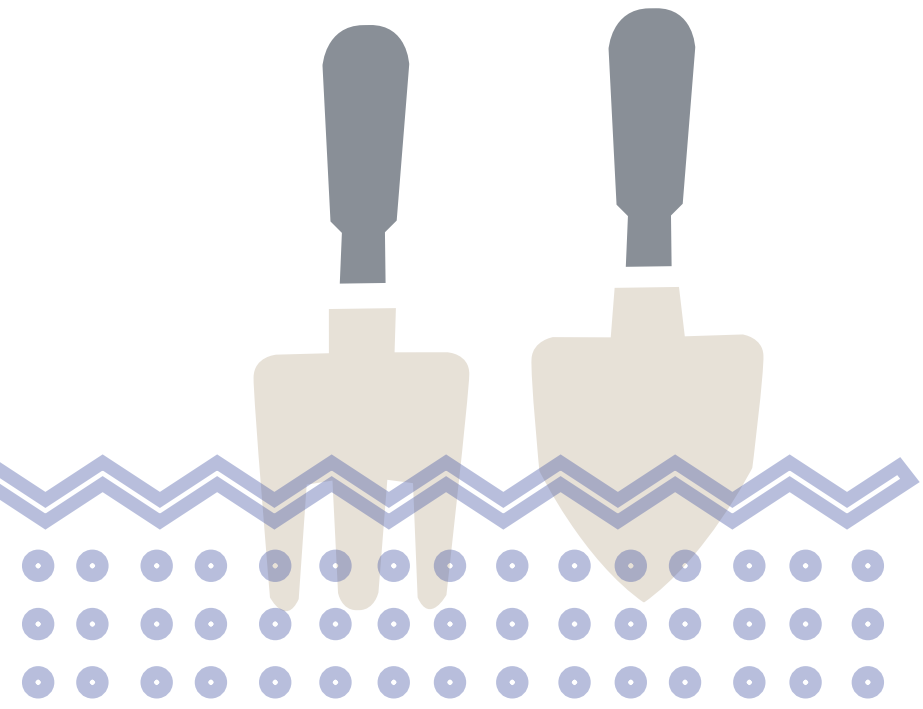
- Desert plants prefer soil that is high in mineral content—gravel, sand, and clay. By contrast, plants native to floodplains and fertile prairielands thrive in rich soil with plenty of organic matter.

GARDENER'S TIP

- If a plant in the garden is not currently growing well, students may be able to amend (improve) the soil in that spot to better meet the plant's needs. Ask students to reach out to a gardener or local plant nursery for soil advice specific to this type of plant.

NUTRITION FACTS

- Minerals have to be absorbed through the soil because plants cannot produce minerals. Without the minerals present in the soil, the plant cannot take them up through its roots and the minerals would not be present in the plant for us to eat!



STANDARDS FOR LESSON 4 LESSON MAP

NG:3-LS3.2 Use evidence to support the explanation that traits can be influenced by the environment.

3-LS3 Science and Engineering Practices

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

SL3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

Math 3.OA.A.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.

LESSON 4 LESSON MAP

Lesson 4: Plant Growth and Soil Type

Day 1: Introduction to Plant Growth

- Ask essential questions.
- Students record predictions and thoughts in science journals.
- Teacher models how to plant seeds.

Day 2

- Students learn how to plant seeds into red solo cups.
- Water plants.
- Place in a safe outdoor space.

Day 3

- Students journal predict how well they think their plant will grow.
- Water plants.

Day 4–9

- Students research plants around the world and determine best types of soil.
- Measure plants every two days.

Day 10

- Students make final observation and record.
- They will compare and contrast their plant growth with other students.

Garden Observation

- Students measure lengths of different plants in the garden.
- Record measurements in their journal

Day(s) 2

Math

Measurement of plants

Day(s) _____

GLL

Plant growth book

Literary Elements

Literacy connection

Day(s) _____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

PLANT MEASUREMENT RECORDING SHEET

Directions: Measure your plant every two days. Record your measurement on this sheet. Draw a picture of your plant to go with your measurement.

Day 1 Measurement _____

Diagram

Day 3 Measurement _____

Diagram

Day 5 Measurement _____

Diagram

Day 7 Measurement _____

Diagram

Day 9 Measurement _____

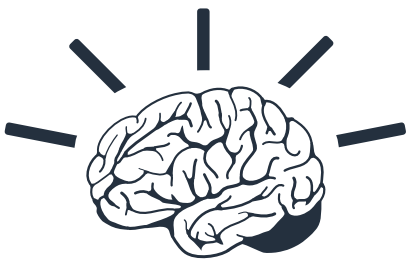
Diagram

Day 11 Measurement _____

Diagram

Lesson Five

Soil Water Absorption



BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students will conduct a scientific experiment to explore how different soils retain different levels of moisture.

OBJECTIVE

- Students will conduct a simple experiment on different soil types to discover the volume of water each type of soil absorbs and retains over time.
- Students will learn how the water absorption factor affects the growth of specific types of plants.

STANDARD

Nevada Standards

NV(3)1.1 Identify, gather and safely use tools and materials needed in investigations.

NV(3)1.3 Conduct investigations based on observations and questions raised about the world.

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)3.1 Investigate and describe that the Earth is composed of different kinds of materials (rocks, soil, water, air).

NV(3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

Next Generation Science Standards

3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment (soil type).

3-LS3 Science and Engineering Practices

Analyzing and Interpreting Data: Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing qualitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning.

Constructing Explanations and Design Solutions: Constructing explanations and design solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence to support an explanation.

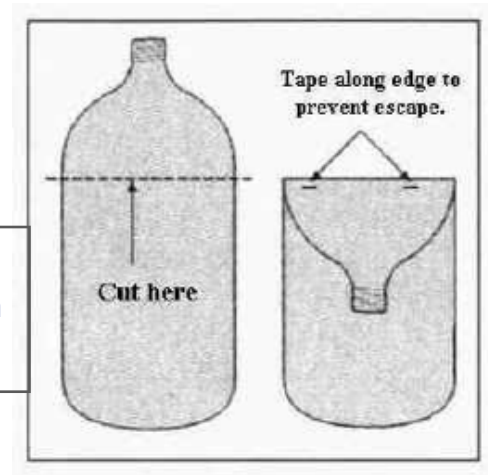
TEACHER INFORMATION

When soil is watered, either by rain or irrigation, the water that penetrates the soil will begin to fill the spaces between the soil particles. There are three different types of soil particles: (from largest to smallest) Sand, Silt, and Clay. Think of the sizes in relation to a beach ball, frisbee and a dime. When the spaces in the soil are filled, the remaining water will flow across the surface of the soil as runoff. The amount of water soil can absorb prior to runoff is the absorption rate. The absorption of the soil depends on a variety of factors: amount of organic matter in the soil, type of soil (sandy, loamy, clay).

TIME

Day 1: 30 minutes and checking soil moisture after the first day, third day, and fifth day.

Remember to place at least two coffee filters in the basin to hold the soil



QUESTIONS

- How does soil act like a sponge?
- Which soils are the most sponge-like?
- How important is it for soil to be able to “hold” water?
- How will you determine the perfect mixture of sponge-like soil?

MATERIALS

For the Class

- Science journal for each student
- Measuring cup
- Sponge
- Bowl
- Marker

For Each Group of 4

- Empty 2-liter plastic soda bottle
- Coffee filters (a cheese cloth is better as it has a tighter weave)
- Different soil types (garden soil, clay soil, sandbox soil, etc.)
- Measuring cup or graduated cylinder
- Masking-tape label

Preparation:

1. To prepare a filter jar, cut off the top one-third of a 2-liter plastic soda bottle. Invert the bottle and place at least 2 coffee filters in the 'basin' (see left).
2. Be sure that the soil samples are equally moist. The experiment will have unpredictable results if one group's soil is very dry and another's soil is very wet.

PROCEDURE

Teacher Introduction to Lesson

To introduce the concept of absorbency, the teacher will hold up a sponge and a cup of water. The teacher will ask, "What do you think will happen if I pour water on the sponge?" Teacher will record predictions on the class board. Hold the sponge above the bowl and pour about ½ cup of water onto the sponge.

Discuss: "How does the sponge hold the water? Which soils are the most sponge-like? How important is it for soil to be able to hold water?"

Student Action

1. Divide students into their groups; each group should have different soils. Give students time to examine the soil and make comments about what they notice about their particular soil. Encourage students to take a handful and squeeze the soil. Have students draw a diagram of what they notice in their science journals as well as any properties they can add to practice using details in science journaling.

2. Have students peruse the other soils and then ask the class to predict which soil will absorb the least amount of water and which will hold the most water, giving the reasons for their predictions. Have students write their predictions in their science journals, supporting them with evidence.

3. Give each group a filter jar and a strip of masking tape so members can label it with their group name.

4. Ask a volunteer in each group to place 2 cups of the soil in the filter.

5. Ask another volunteer to pour exactly 3 cups of water into the filter. The water should be poured all at once, not little by little.

6. While the groups are waiting for their soil to drain, have students discuss how they think a soil's ability to hold water affects plant growth and why?

7. When the draining has stopped, have students pour the water from the jar into the measuring cup. Ask them to also feel the soil in the filter.
   Note: If a group has heavy clay soil, most of the water may still be sitting on top of the soil/filter mixture.

8. Ask each group to bring its cup of drainage water to the front of the class. Arrange the cups in order from least to most water so that students can rate the soils from most absorbent to least absorbent. For example, 1=soil that holds the most water.

9. Have each group record the soils rating in their science journal. Students should also record observations such as the color of the drainage water and how quickly their soil drained.

10. Ask each group to discuss what kind of plants would probably grow well in their particular soil. Based off of the classrooms results, ask students to reflect on the question of how they will determine the perfect mixture of sponge-like soil. Have them write their thoughts in their science journals. Entries should contain information such as plants that need a lot of of water vs. plants that do not need a lot of water.

Next Day: Students should observe and record if more water has collected in their drainage jar.

Three days later: Students should observe and record if more water has collected in their drainage jar.

Five days later: Students should observe and record if more water has collected in their drainage jar.

Students should make a final observation and provide a conclusion of how each type of soil absorbed water and retained that specific amount of water.

ASSESSMENT

In their science journals, students answer and provide supportive information to the questions they posed at the beginning of the lesson. More questions include: Which soil holds the most water? Which holds the least? What do you think makes some soils more absorbent than others and why? After recording answers in their journals, class will discuss their thoughts.

Throughout the lesson, students will constantly review their journal entries. Students should make connections among the information, make predictions and form conclusions.

ADAPTATIONS

Prior to conducting this lesson, some students may need to make a direct connection to objects absorbing specific amounts of water. The teacher may want to bring in everyday objects from home such as a sponge, a hand towel, a paper towel, and a paper towel from school, tissue, etc. Students can make a direct connection of absorbency as they interact with these objects and how much water they absorb.

- Discuss why the color of the drainage water may be different for different soils. Some of the organic materials in the soils are easily dissolved or picked up and carried through the coffee filter. Each soil varies in the type and amount of such substances.
- Cut off both ends of several cans and set them in different types of soil (sand box, clay soil, garden soil) around the school. Fill each can with 1 inch of water. Compare how long it takes for the water to drain completely into the soil at each spot.

DIGGING DEEPER

- Ask students how they think water would be absorbed into the following soils. Would it stay in the soil or quickly drain out?

  A dry lake bed of clay
  A sandy beach
  A peat bog
  A gravelly stream bank

- A soil's depth determines how much water it can hold. Have students fill one cup nearly to the top with soil. Have them cut the top half off an identical cup and fill it nearly to the top with the same type of soil. Ask them to slowly pour water into the cups until both are full. Have them observe the similarities and differences.
- Have students fill a terrarium with desert soil. Slowly add water and let it percolate through the layers. Do some layers absorb more water than others? How quickly or slowly is the water absorbed? Have students try the same experiment with as many types of soil as they can collect, noting the differences.

GARDENER'S TIP

- Water the garden while students observe. Have them note any areas where water is draining out excessively instead of being absorbed into the soil. As a class, determine what course of action to take in each case, whether this means repairing a bed, amending soil, or adding or subtracting plants.

GARDENER'S TIP

- Each plant has a different mineral absorption profile. For example, sweet potatoes absorb more minerals than regular potatoes.

STANDARDS FOR LESSON 5 LESSON MAP

NG:3-LS3.2.C Use evidence to support the explanation that traits can be influenced by the environment.

3-LS3 Science and Engineering Practices

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.OA.A.4 Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 x ? = 48, 5 = ? ÷ 3, 6 x 6 = ?.

LESSON 5 LESSON MAP

Lesson 5: Soil Water Absorption

Day 1

- Teacher introduces lesson concept of absorbency.
- Students make predictions and record their ideas on the board.
- Class discussion on the results.

Day 2

- Students examine their soil.
- What do they notice?
- Write down observations in their science journals.
- Students examine by touching and squeezing the soil.

Day 3

- Students observe soils of other students and make predictions of which soil will absorb the least amount of water, which will absorb the most.

Day 4

- Students create their soil jars and label their jars with team names.
- Students water their soil and observe.
- Drain water and class observation.

Day 5-9

- Students observe and record if more water has been collected.

Day 10

- Students make final observations and provide conclusions of each soil and how it absorbed water.

Garden Observation

- Students observe differences in soil from sunken level beds and raised beds.

Day(s) 2

Math

Unknown Numbers

Day(s) ____

GLL *In the Garden* with Dr. Carver

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) ____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

SOIL OBSERVATION SHEET

1. What does your soil look like immediately after watering it?

2. What does your soil look like after a few days of watering?

3. What does your soil look like after a week or more of watering?

Name:_____

Date: _____

UNKNOWN NUMBERS IN THE GARDEN

1. There are 8 earthworms in the garden bed. Each earthworm eats through 4 pieces of leaves each week. How many pieces of leaves did the earthworms eat all together?

8 x 4 = _____

2. There are 45 flowers in the garden. The gardener planted 5 flowers into each garden bed. How many garden beds were there in the garden.

45 / 5 = _____

3. Each student in Mr. Magoo's 3rd grade class has 3 seeds. They all plant the seeds in the garden. When the seeds bloom into flowers, there are 33 flowers in the garden. How many students had seeds to plant?

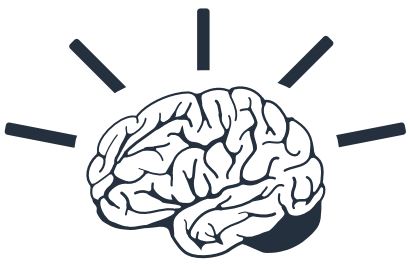
3 x _____ = 33

4. There are 24 heads of lettuce in the garden. 6 rabbits each ate some of the heads of lettuce. If they each ate the same amount of lettuce, how many heads of lettuce did each rabbit eat?

24 / 6 = _____

Lesson Six

Soil Degradation



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3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

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OVERVIEW

Students will explore how soil changes over time.

OBJECTIVE

- Students will understand what land degradation is.
- Students will discuss causes of land degradation (farm runoff, habitat desctruction, pesticide and fertilizer use, pollution, erosion, etc.) and how it affects the environment.

STANDARD

Nevada State Standards

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)3.1 Investigate and describe that the Earth is composed of different kinds of materials (rocks, soil, water, air).

NV(3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

NV(3)4.6 Investigate and describe how changes to an environment can be beneficial or harmful to plants and animals.

Next Generation Science Standards

3-LS3-2.C Ecosystem Dynamics, Functioning, and Resilience

When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

TEACHER INFORMATION

The degradation of soil occurs for a variety of reasons: the natural vegetation has been cleared and/or the land has been over plowed or over grazed. One of the best examples of soil degradation is the Great Dust Bowl of the 1930's. This huge dust storm that happened in the Great Plains of the United States caused huge devastation and destruction in people's lives.

TIME

Day 1:30 minutes and checking soil moisture after the first day, third day, and fifth day.

QUESTIONS

- What is soil degradation?
- What causes soil degradation?
- How does soil degradation affect the environment?
- How is soil degradation different in various geographical areas?

MATERIALS

- Science Journals
- Discovery Education - *Agriculture and the Environment* video
- YouTube Video - *Impacts of Agriculture on the Natural Environment* https://www.youtube.com/watch?v=B4a-SXyoPOM

PROCEDURE

1. Teacher plays either or both videos: *Agriculture and the Environment* using Discovery Education.
2. Teacher leads a class discussion about soil degradation, what causes it and how it effects the environment or *Impacts of Agriculture on the Natural Environment* from YouTube https://www.youtube.com/watch?v=B4a-SXyoPOM
3. Students answer the following questions in their science journals: What is soil degradation? What causes soil degradation? How does soil degradation affect the environment? How is soil degradation different in various geographical areas?

ASSESSMENT

Students answer lesson questions in their science journals.

ADAPTATIONS

- Students draw pictures showing soil degradation and how it influences the environment.
- Students look at the school garden or around the school campus and identify soil degradation taking place.

DIGGING DEEPER

- Have students search for terms like “rock,” “rock cycle,” “limestone,” “sandstone,” and “silt” to learn more about how rocks and soils are formed and how they change over time.
- Study the time of the “Dust Bowl” of the 1930’s.
- Study the lessons of Thomas Jefferson and his farming practices. A great book for teachers on this subject: Founding Gardeners: The Revolutionary Generation, Nature, and the Shaping of the American Nation By Andrea Wulf.

DID YOU KNOW?

- Soil has many functions.

  Support: holds and supports plant roots
  Cleanses: absorbs/filters toxins
  Respiration: absorbs atmospheric gases and recycles back into the soil
  Digestion: breakdown of organic matter
  Storage: absorbs and stores water
  Solvent: dissolves chemicals for root uptake

NUTRITION FACTS

- The decline in nutritional values of our foods is due in part to mineral depletion of the soil.

STANDARDS FOR LESSON 6 LESSON MAP

NG:3-LS3.2.C Use evidence to support the explanation that traits can be influenced by the environment.

3-LS3 Science and Engineering Practices

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LESSON 6 LESSON MAP

Lesson 6: Soil Degradation

Day 1: Play video

- Agriculture and the Environment using Discovery Education.
- Class discussion about soil degradation, what causes it, and how it effects the environment.

Day 2: Students answer essential questions in their science journals

- What is soil degradation?
- What causes soil degradation?
- How does soil degradation effect the environment.

Day 3, 5, 7

- Students check soil moisture.

Day 5

- Study lessons of Thomas Jefferson and his farming practices. Use book Founding Gardeners.

Garden Observation

- Students observe soil degradation taking place and record in science journals.

Day(s) 2

Math

Division/Measurement of soil degradation

Day(s) _____

GLL *Founding Gardeners* by Andrea Wulf

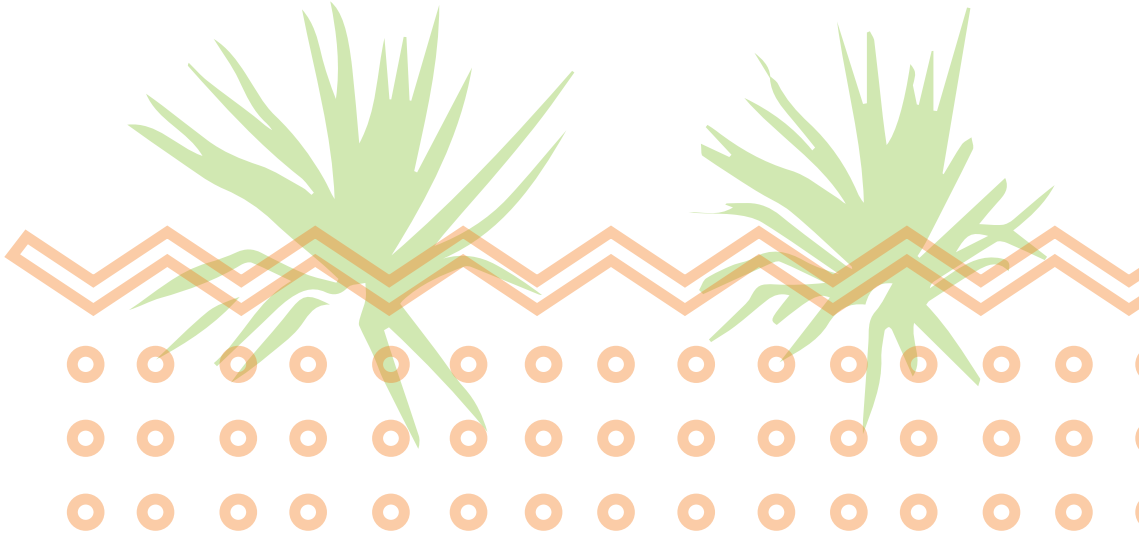
Literary Elements

Literacy connection:

Day(s) _____

Science/Social Studies Extension

Garden Observation



Name:_____

Date: _____

SOIL DEGRADATION ESSENTIAL QUESTIONS

1. What is soil degradation?

2. What causes soil degradation?

3. How does soil degradation affect the environment?

Name:_____

Date: _____

1. Amy bought several packets of seeds at the grocery store and ended up with twelve seeds total. If each packet had two seeds how many packets did she buy?

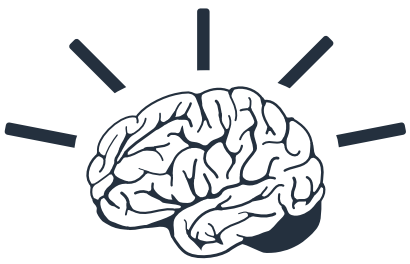
Draw a picture, explain in words and create a math sentence.

2. For Earth Day Armando received sixteen carrots. If he put them into piles with eight in each pile, how many piles could he make?

Draw a picture, explain in words and create a math sentence.

Lesson Seven

Soil and Weather



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6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students will explore the affects of different types of weather on soil.

OBJECTIVE

- Students will understand that soil is affected by weather (temperature and rainfall).
- Students will track temperature, rainfall and moisture levels in the soil, over time.

STANDARD

Nevada State Standards

NV(3)1.1 Identify, gather and safely use tools and materials needed in investigations.

NV(3)1.4 Keep a record, in a science notebook, of observations and measurements taken over time.

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)1.7 Use observable patterns to organize items and ideas and to make predictions.

Next Generation Science Standards

3-ESS2-1 Earth's Systems

Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

TEACHER INFORMATION

Climate impacts soil in a big way, from temperature to the amount of rainfall. Many weather conditions can leach away minerals from the soil, which can help determine the amount of organic matter in the soil. The type of vegetation that grows and thrives in the soil is in large part due to the climate of the area. For example, soil needs rainfall but too much rain can erode the soil. Drought can leach the soil of minerals and nutrients which can lead to a desert.

TIME

Approximately 50 minutes, 5 minutes each day over time

QUESTIONS

- How does weather affect soil?
- What are the affects if there is too much/too little rain? Heat? Wind?

MATERIALS

- Science Journals
- Thermometer
- Rain Gauge
- Soil Moisture Probe

PROCEDURE

1. Students and teacher discuss the effects of rain and temperature on soil.
2. Students and teacher set up a weather station and soil probe.
3. Record the initial readings on a class chart (temperature, rainfall, moisture level)
4. Students and teacher record readings over time.
5. Teacher and students discuss patterns and make predictions about weather. Students and teacher discuss the weather and it's affects on the garden.

ASSESSMENT

Students will write a paragraph about their observations over time. They will explain the affects weather had on the garden.

ADAPTATIONS

- Teacher makes copies of unlabeled charts and graphs. Students will label charts and graphs and glue them in their science journals.
- Students engineer a rain gauge and/or a wind vane for their home gardens.

DIGGING DEEPER

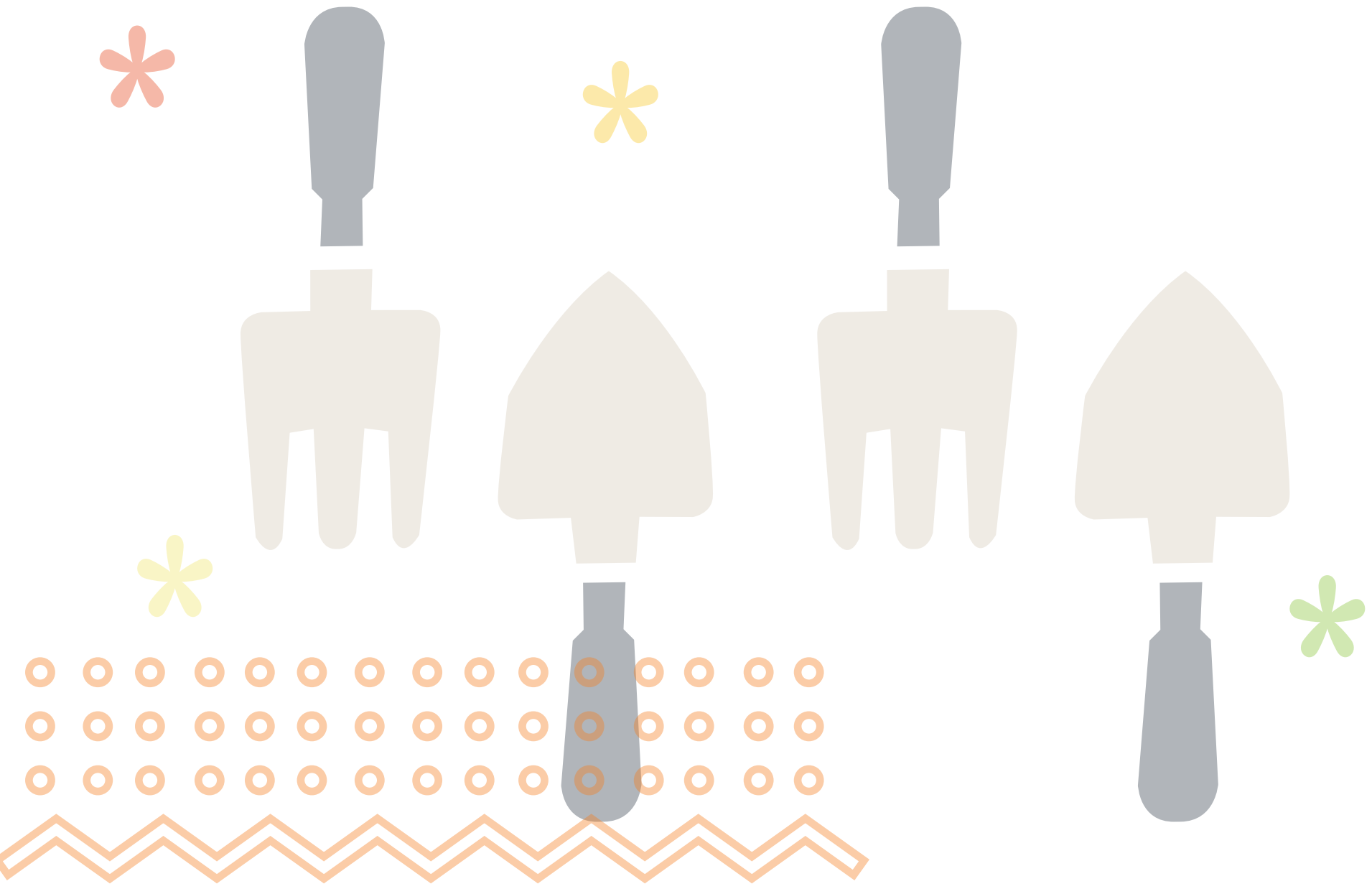
- Have students list as many desert land and water features as they can name, such as playas, arroyos, canyons, and mesas. Ask the students how they think the various shapes and features were created by nature. Have them do research to uncover the answers.

DID YOU KNOW?

- Desert rock formations like arches and hoodoos are shaped over time by weather, wind, and water. A natural arch is formed when water or weather hollows out a cliff. A hoodoo takes shape when a soft rock layer is deposited under a hard one. The soft layer below erodes first, leaving a big top.

NUTRITION FACTS

- Food grown in nutrient-deficient soil lacks the nutrients needed to keep people healthy.



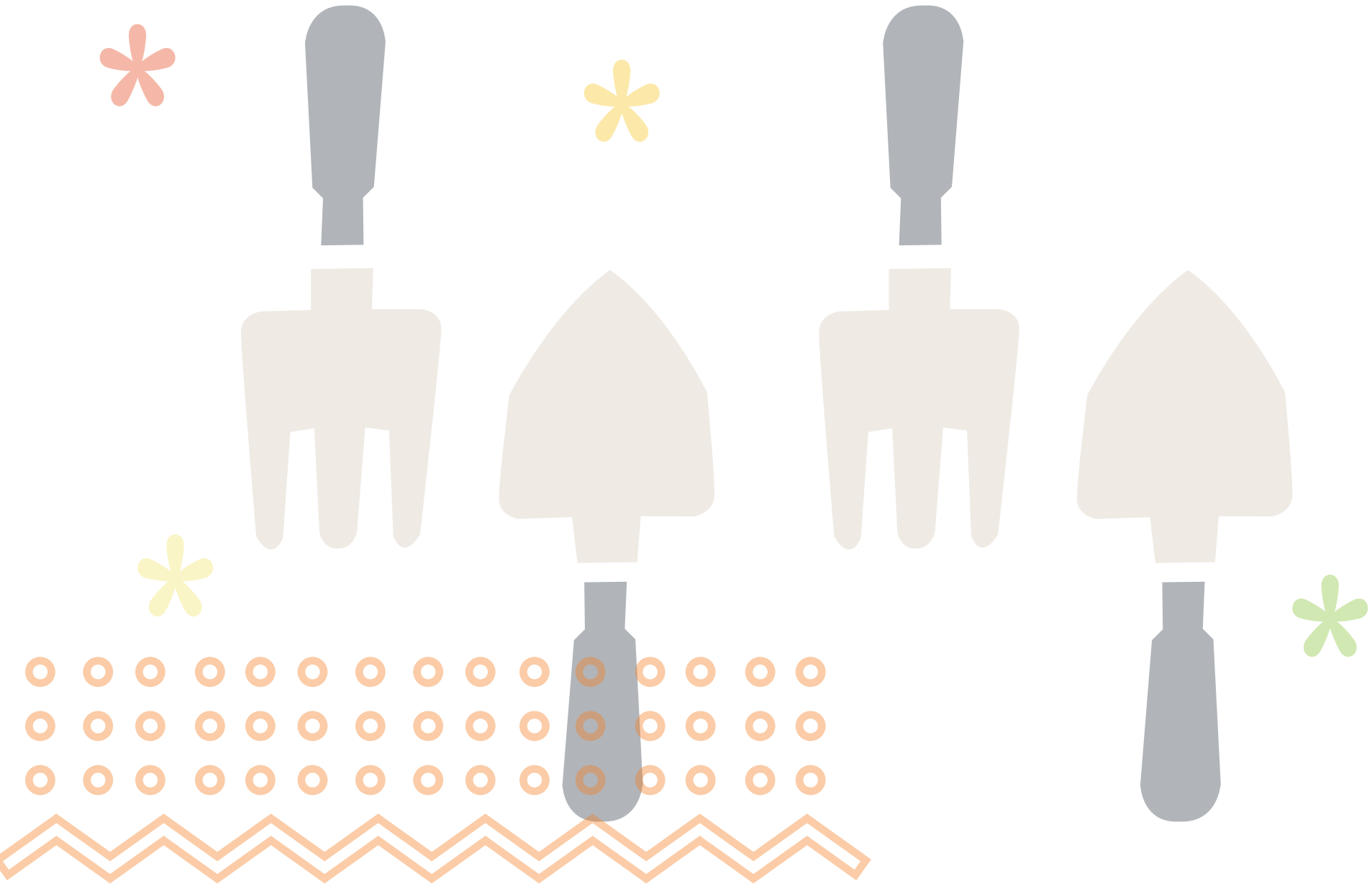
STANDARDS FOR LESSON 7 LESSON MAP

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.

Writing W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Math 3.NF.1 Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.



LESSON 5 LESSON MAP

Lesson 7: Soil and Weather

Day 1

- Teacher creates wind gauge, rain gauge ahead of time or with students.
- They have a discussion about the purpose of these instruments.
- Students discuss the affects of rain and temperature on soil.

Day 2

- Students and teacher set up weather station and soil probe.

Day 3

- Record initial readings on a class chart (temperature, rainfall, moisture level)

Day 4–8

- Students record readings each day from weather station.

Day 4

- Students write down as many desert land and water features they can think of.
- Ask students to record how various shapes and features were created by nature.

Day 5–7

- Students continue to record readings and research and record how various shapes were created by nature.

Day 8

- Students write a paragraph about their observations over time.
- They will explain the affects weather had on the garden.

Garden Observation

- Students observe and record weather and how it may have affected the shapes of the garden.

Day(s) 2

Math

Classroom Activity Sheet 1

Day(s) _____

GLL

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

GARDEN WEATHER OBSERVATION

1. What does the weather feel like?

2. What does the weather look like?

3. How does the current weather affect the garden?

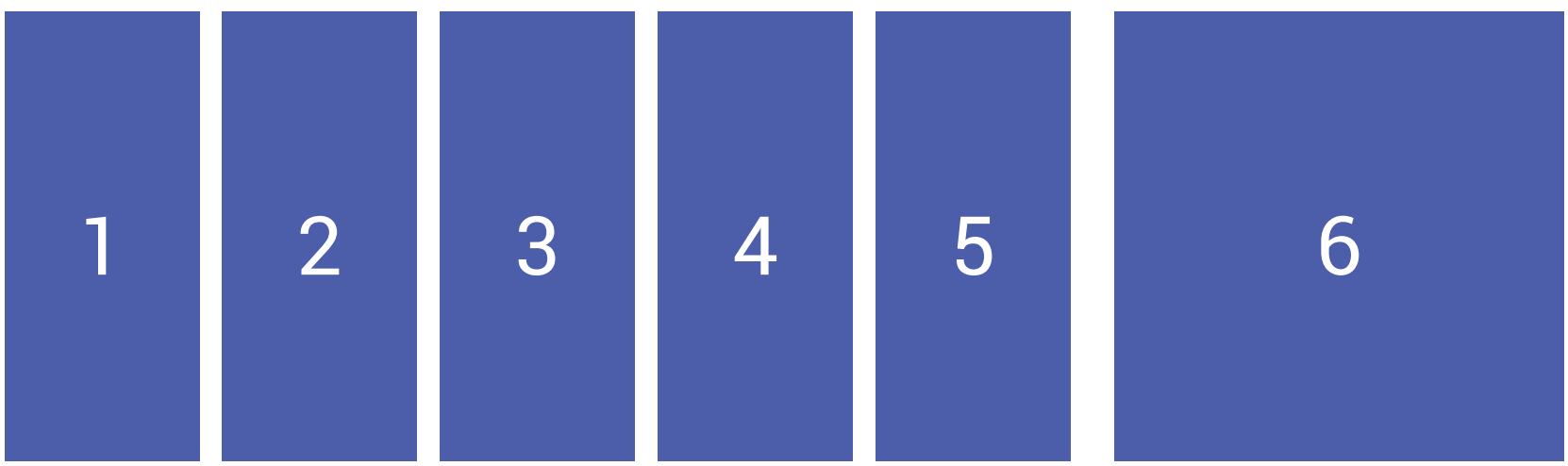
Name:_____

Date: _____

OUTDOOR CLASSROOM – ACTIVITY SHEET 1

By Vincent D Ortiz

OUTDOOR CLASSROOM MAP



The 3rd grade class wants to begin planting a beautiful and healthy garden at their school Before they can plant even one seed, they need to present a map of what kinds of seeds they are going to plant, and where they are going to plant those steeds.

Below is the students' plan for what they want to grow in each gardening bed.

Enrollment in local colleges, 2005

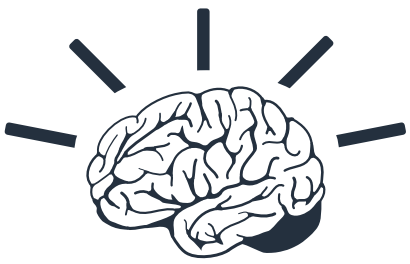
Bed #	Beets	Carrots	Cauliflower
	Rectangular Beds		
Bed 1	1 Third	1 Third	1 Third
Bed 2	1 Fourth	0 Fourths	3 Fourths
Bed 3	2 Sixths	1 Sixth	3 Sixth
Bed 4	0 Eights	3 Eighths	5 Eighths
Bed 5	2 Twelfths	3 Twelfths	5 Twelfths
	Square Bed		
Bed 6	1 Fourth	2 Fourths	1 Fourths

a. In the space below, draw gardening beds 1 through 6, and divide them into the fractions shown in the table above. Be sure to shade each different type of vegetable a different color so that the students can easily tell where to plant each one.

Beets Color:_____ Carrots Color_____ Cauliflower Color_____

Lesson Eight

Amending the Soil



BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

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OVERVIEW

Students will explore how to amend soil and make improvements to soil in the school garden.

OBJECTIVE

- Students will understand how soil can be improved (amended).
- Students will use the worm farm and/or compost materials to amend the soil in the school garden.

STANDARD

Nevada State Standards

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)3.1 Investigate and describe that the Earth is composed of different kinds of materials (rocks, soil, water, air).

NV(3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

NV(3)4.3 Investigate and describe the interactions of organisms with each other and their ecosystem.

NV(3)4.6 Investigate and describe how changes to an environment can be beneficial or harmful to plants and animals.

Next Generation Science Standards

3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment (soil type).

3-LS3 Science and Engineering Practices

Analyzing and Interpreting Data: *Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing qualitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning.*

Constructing Explanations and Design Solutions: *Constructing explanations and design solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence to support an explanation.*

TEACHER INFORMATION

Composting provides a partial solution to an issue of great concern in many communities. All around the country, landfills are filling up, garbage incineration is becoming increasingly unpopular, and other waste disposal options are becoming ever harder to find. Composting provides a way not only of reducing the amount of waste that needs to be disposed of, but also of converting it into a product that is useful for gardening, landscaping, or house plants.

By addressing the solid waste issue, composting provides a way of instilling in children a sense of environmental stewardship. With composting, children can do more than just send cans or newspapers off for recycling -- they can see the entire cycle, from “yucky” food scraps or other organic wastes to something that is pleasant to handle and is good for the soil. Contrary to the “out of sight, out of mind” philosophy, children who compost become aware of organic wastes as potential resources rather than just as something “gross” to be thrown away and forgotten. They learn through direct experience that they personally can make a difference and have a positive effect on the environment.

TIME

Approximately 30-60 minutes (depending on activity)

QUESTIONS

- How do you use compost material in the gardens?
- How do you use worm farm materials in the garden?
- Do you want them to be the same as far as material in the gardens or materials in the garden?

MATERIALS

For the Class

- Science journal for each student
- Worm Farm and/or Compost Bin
- Pot/bucket
- Fish Tank Aerator
- Cheesecloth or Pantyhose
- 2 Tablespoons Molasses
- 4 Gallons Water - let sit 24 hours to release chlorine

PROCEDURE

▸ Compost Bin

1. Teacher spreads compost material on a large sheet of butcher paper.

2. Students pick out worms and place them back in the compost bin (if you have worms in your bin).

3. Students pick out any large pieces that may not have been broken down and place them back in the bin.

4. Place some of the compost material back into the compost bin and continue composting.

5. Gather compost materials and mix into the garden soil and around plants.

Worm Farm

1. Remove approximately 2 cups of worm castings from the farm and place in a stocking or cheesecloth.

2. Place approximately 4 gallons of water in the bucket.

3. Add 2 tablespoons of molasses.

4. Place the aerator in the bottom of the bucket and turn it on.

5. Hang the stocking/cheesecloth over the side of the bucket so it is in the water and let it bubble for approximately 1-4 days.

6. Using worm compost tea: water the garden, houseplants, seedlings or baby plants, or spray on leaves.

ASSESSMENT

Students will make a picture of the compost bin cycle or the worm farm compost cycle (see example).

ADAPTATIONS

- Teacher makes copies of the compost cycle.
- Students will label and glue them in their science notebooks.
- Students orally tell about the compost cycle.
- Students make a video of how to compost and/or worm farm.

DIGGING DEEPER

- Ask students why worms are useful in the garden. What can worms do for the garden that other creatures such as caterpillars cannot do? How do worms change the soil?
- Have students investigate what kind of soil worms like. Do different types of worms prefer different soils?

DID YOU KNOW?

- Many types of worms would not be able to survive in southern Nevada's dry desert environment. Sandworms (Arenicola marina), for example, thrive at the seaside. They dig burrows in the beach and spend much of their lives underwater.
- More than 70% of gardening problems are attributed to poor soil.

NUTRITION FACTS

- Nutritional values in food have declined significantly over the past 70 years meaning fruits and vegetables grown in the past were richer in vitamins and minerals than the varieties most of us get today

STANDARDS FOR LESSON 8 LESSON MAP

NG:3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.

3-LS3 Science and Engineering Practices

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.MD.A.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (Excludes compound units such as cm3 and finding the geometric volume of a container.) Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (Excludes multiplicative comparison problems involving notions of “times as much”’see Glossary, Table 2).

LESSON 8 LESSON MAP

Lesson 8: Amending the Soil

Day 1

- Teacher engages students in a discussion about items that can be recycled.
- Create a class chart on items that can/cannot be recycled.

Day 2

- Create compost bin with materials required.

Day 3

- Create worm farm with students.

Day 4–6

- Students observe the worm farm for 2 days.

Day 6

- Students make a picture of the compost bin cycle or the worm farm compost cycle.

Garden Observation

- Students observe composting bin in the garden and items that have been recycled in the bin.
- Create a visual representing items they found in the compost bin.

Day(s) 2

Math

Measure and estimate liquid volumes

Day(s) _____

GLL

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

STUDENT RECYCLING RECORDING SHEET

Items that Can Be Recycled	Items that Cannot Be Recycled

Name:_____

Date: _____

MEASUREMENTS OF COMPOST SOIL

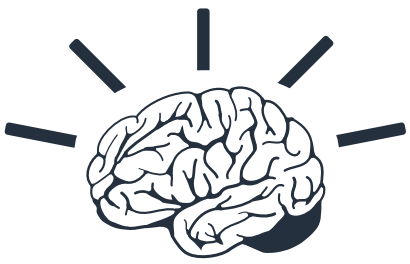
1. A farmer loads two sacks of carrots into a box. The total weight of the two sacks is 129kg. One sack weighs 90kg. What is the weight of the other sack?

2. A grocer splits a 75kg tub of apples into five smaller tubs. Each tub holds the same amount. How many kilograms of apples are in each tub?

3. Ben removed 450ml of water from his fish bowl. If he left 125ml of water in the fish bowl how much water did it have to begin with?

Lesson Nine

Plant Growth – To Compost or Not to Compost



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OVERVIEW

Students will conduct a scientific experiment to determine if amended soil affects plant growth.

OBJECTIVE

- Students will conduct a scientific experiment to determine if amended soil affects plant growth.
- Students will plant seeds in the soil they amended with compost and also in the non-amended soil. Students will predict how well the seeds will grow in each type of soil.
- Students will record data over time.

STANDARD

Nevada State Standards

NV(3)1.1 Identify, gather and safely use tools and materials needed in investigations.

NV(3)1.3 Conduct investigations based on observations and questions raised about the world.

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)3.1 Investigate and describe that the Earth is composed of different kinds of materials (rocks, soil, water, air).

NV(3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

NV(3)4.3 Investigate and describe the interactions of organisms with each other and their ecosystem.

NV(3)4.6 Investigate and describe how changes to an environment can be beneficial or harmful to plants and animals.

Next Generation Science Standards

3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment (soil type).

3-LS3 Science and Engineering Practices

Analyzing and Interpreting Data: Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing qualitative approaches to collecting data and conducting multiplet trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning.

Constructing Explanations and Design Solutions: Constructing explanations and design solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence to support an explanation.

TEACHER INFORMATION

Soil amendments are elements that are added to soil (compost, fertilizer, or peat moss) to improve its capacity to support plant life. Peat moss improves the texture and drainage of the soil while adding fertilizers improves the soil's nutrient value. Compost improves both the drainage and the nutrient levels of the soil.

TIME

Approximately 2 weeks.

QUESTIONS

- Why is soil important to plant growth?
- How does adding nutrients to the soil through composting and/or worm farming affect soil? Plant growth?

MATERIALS

- Amended soil from previous lesson
- Non-Amended soil
- Red solo cups (with holes in the bottom)
- Measuring cup(s)
- Water
- Seeds (sunflower or radish)
- Science Journals

PROCEDURE

1. Teacher models how to plant seeds.
2. Students label the cups: amended, non-amended with student name or initial.
3. Students pour the soil into the red solo cups ½ inch from cup rim.
4. Students place seeds in a hole as deep as the seed is wide.
5. Students water the seeds with ½ cup tap water.
6. Students repeat steps 2-4 with non-amended soil.
7. All students place the plants in the same outdoor space.
8. Students predict how well they think the plants will grow and why. Students will record their predictions in their science journals.
9. Students check the plants every 2 days, measuring plant growth and recording observations and measurements.

10. Students water the plants each day with ¼ cup of tap water.

11. After approximately 2 weeks, the students make their final observations and reflect on their predictions. Students will re-read their journal entries and draw conclusions about their plant's growth based on the use of amended and non-amended soil.

12. Discuss as a class and compare results.

ASSESSMENT

Students write a reflection in their science journals answering the lesson's question.

Throughout the lesson, students will review their journal entries and analyze their data. They will compare their graphs of the height of the plant, specific observations pertaining to properties such as plant color, plant texture, plant smell, etc.

Students will make connections among the information, form predictions, and draw conclusions.

ADAPTATIONS

- Students may use an iPad or any other form of technology to take pictures of their plant after each journal entry and print/paste their picture in the journal. Students can also record their information using technological software.
- Students will conduct experiments using different types of plants, e.g. fruits, vegetables, flowers, trees, etc.
- Students can participate in the Bonnie Cabbage 3rd Grade Program and conduct an experiment using their Bonnie Cabbage plant.
  Go to: http://bonniecabbageprogram.com

DID YOU KNOW?

- While most plants prefer 'good' soil, there are some extreme exceptions to this rule in nature. Russian sage grows well in hot, dry clay. Mangrove trees thrive in shifting tidal soil that is sometimes covered in saltwater. Garden edibles that perform well in poor soil include watermelons, Jerusalem artichokes, and many herbs.
- The healthier your soil, the healthier the nutritional value of the food that is grown in the soil. HEALTHY SOIL = HEALTHY PLANTS = HEALTHY PEOPLE

NUTRITION FACTS

- Fruits and vegetables grown in soil that is phosphorous rich have less starch and sugar, and higher concentrations of other important minerals and nutrients.

STANDARDS FOR LESSON 9 LESSON MAP

NG:3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.

3-LS3 Science and Engineering Practices

3-LS-4 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.MD.A.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (Excludes compound units such as cm3 and finding the geometric volume of a container.) Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (Excludes multiplicative comparison problems involving notions of “times as much”’see Glossary, Table 2.)

LESSON 9 LESSON MAP

Lesson 9: Plant Growth: To Compost or Not to Compost

Day 1

- Teacher engages students in a discussion about amended vs. non-amended soil.
- Preview activity that compare/ contrast planting seeds in amended vs. non-amended soil.

Day 2

- Teacher models how to plant seeds.
- Students pour soil into cups, water seeds then repeat process with non-amended soil.

Day 3

- Continue process from day 2.
- Students make predictions on how they think the plants will grow.

Day 4–10

- Students water plants every day and measure plant growth every two days.
- Students will review their journal entries and analyze their data.
- Compare their graphs of the height of the plant, specific observations on plant.

Day 10

- Students reflect by answering questions from the lesson.
- 1. Is soil important to plant growth?
- 2. Does adding nutrients to the soil through composting and/or worm farming affect soil? Plant growth?

Garden Observation

- Students observe plant growth from plants that are planted using soil from the composting bins.
- They will chart their specific observations on the plant.

Day(s) 2

Math

Time in the Garden

Day(s) _____

GLL

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

SOIL REFLECTION QUESTIONS

1. Is soil important to plant growth?

2. Does adding nutrients to the soil through composting and/or worm farming affect soil? Plant growth?

3. Write a few sentences comparing and contrasting amended soil vs. non-amended soil.

Name:_____

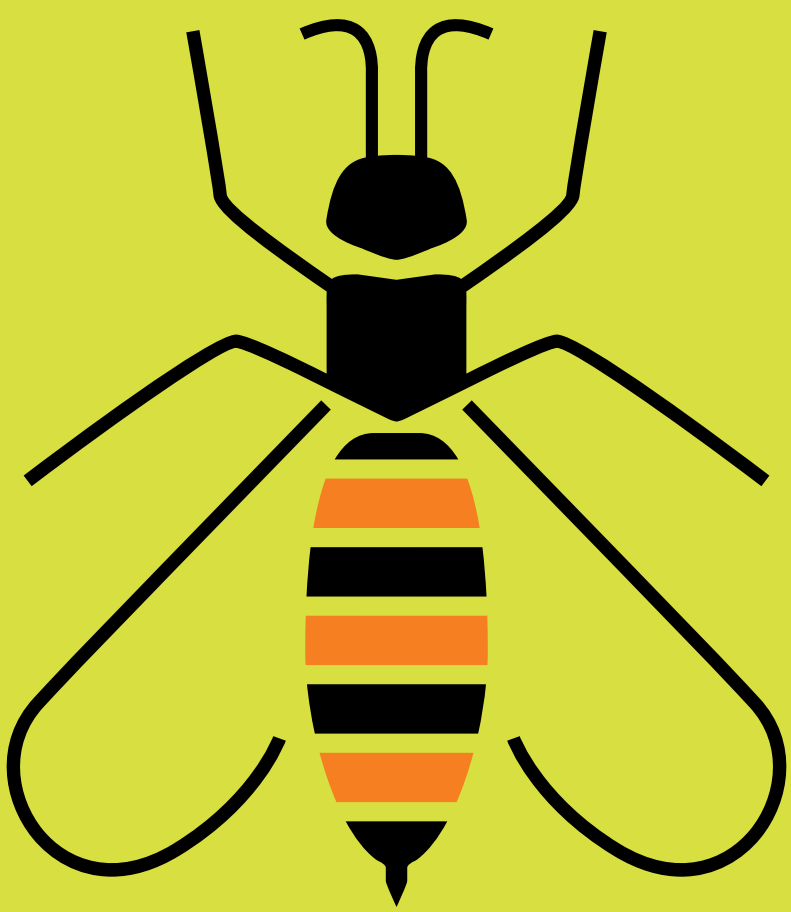
Date: _____

TIME IN THE GARDEN

1. If Julio arrives at the school garden at 7:15 AM and he spends 45 minutes watering the plants. What time does he finish watering the plants?

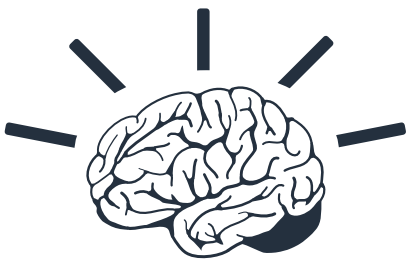
2. If Mark starts pulling weeds from the garden at 7:30 AM and finish at 7:48 AM. How many minutes did it take him to pull all of the weeds from the garden?

3. If Sally started planting seeds in the garden at 6:10 AM and it took her 25 minutes to finish. What time does Sally finish planting all of the seeds?



Lesson Ten

Soil Food Web



BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students will be introduced to the Soil Food Web, its importance to the environment, and how to maintain the health of the Soil Food Web.

OBJECTIVE

- Students will be able to draw and explain the role of soil in the food web.
- Students will be able to discuss the importance of soil to life.
- Students will observe various organisms found within healthy soil, including the worm.
- Students will then observe the life cycle of a worm.

STANDARD

Nevada State Standards

NV(3)1.1 Identify, gather and safely use tools and materials needed in investigations.

NV(3)1.3 Conduct investigations based on observations and questions raised about the world.

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

Next Generation Science Standards

3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment (soil type).

3-LS3 Science and Engineering Practices

Analyzing and Interpreting Data : *Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing qualitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning.*

TEACHER INFORMATION

All plants depend on the soil food web for their nutrition and survival. The Soil Food Web is a wide and diverse variety of organisms. (See the image at the end of this lesson.) The organisms in the soil food web range in size from the tiniest one-celled bacteria, algae, fungi and protozoa, to the larger and more complex nematodes and micro-arthropods, to the earthworms, insects, small vertebrates and plants. All of these organisms live in the soil eating, growing and moving through their life. They help to clean the water, clean the air, and help plants thrive as well as moderate the flow of water in the soil. It's a beautiful thing!

For more information, please check out the following websites:
http://www.soilfoodweb.com
http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/health/biology/?cid=nrcs142p2_053868

TIME

Activity 1: 45 minutes | Activity 2: 30 minutes | Activity 3: 30 minutes

QUESTIONS

- What can you conclude about the role of soil in your life?
- What would life be like without one or more of a specific organism in the soil?
- What would life be like without soil?

MATERIALS

- Soil Food Web activity sheet
- Magnifying glass, light microscope, or some way to observe soil up close
- Rich soil from the garden
- Crayons or markers for labeling signs
- Construction paper or index cards
- Hole-punch
- Yarn

PROCEDURE

Getting started: Gather materials and make soil food web copies for each student. (SEE WORKSHEET BELOW)

- Activity 1: My Soil Food Web
  Discuss the questions with the class and ask for their thoughts. Revisit these questions as you go through the lesson.

1. Provide a sample of garden soil to each group.

2. Have students analyze the soil using a magnifying glass or microscope.

3. In their science journals, students will create a diagram that includes labels of what they see. Provide the students with a Soil Food Web handout (found at the end of this lesson).

4. Provide the students some literature material and/or time to research the types of organisms on the internet. Have students discuss the purpose of each type of organism found in the food web.

▶ The Yarn Web Game

1. After students have presented their information, provide them with a label of each type of organism (hole-punched construction paper with each name LARGELY written on it so the students can wear it around their neck).

   Soil (one person has this label)
   Bird
   Arthropod predator
   Arthropod shredder
   Nematode root-feeder
   Nematode fungal and bacterial feeder
   Nematode predator
   Animals
   Protozoa
   Bacteria
   Fungi
   Organic Matter
   Plants
   (You may want to add more than one 'character' as there are a lot of these organisms within the soil.)

2. Pick any student to begin by tossing a ball of yarn to someone else that they are related to in the food web. For example, arthropod predator can toss the yarn to either an arthropod shredder, a bird, a nematode predator, or an animal as it is directly related to these organisms in the soil food web. Ensure that when a student tosses the yarn they're holding their end of the yarn.

3. If the student is not related to any one of the other items, the yarn can always be tossed to the person wearing the 'soil' sign. An intricate web should be woven. Several students should be tossed the yarn more than once. When everyone has been included in the web, take a look at how they are all connected to the soil.

▶ Discussion of the lesson

1. Working in groups or as individuals, students should describe in their science journals the role of each organism in the soil.

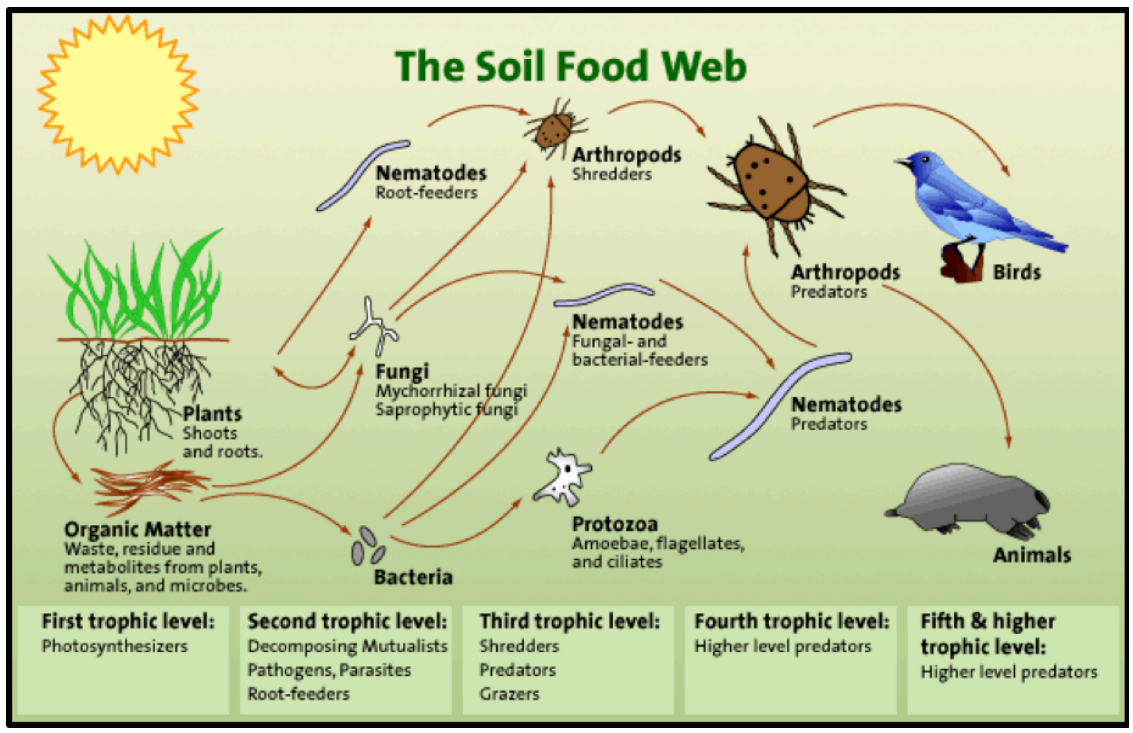
ASSESSMENT

Students reflect upon the questions posed at the beginning of the lesson and provide supportive information to their answer within their science journals. More questions include: What can you conclude about the role of soil in your life? What would life be like without one or more of a specific organism in a soil? What would life be like without soil? After recording answers within their journals, class will discuss their thoughts.

ADAPTATIONS

Some students may need to understand the concept of a web…it is a visual of how things are connected. Have students discuss other types of food webs such as predator and prey. You may want to do a yarn web game using large animals such as dogs, cats, birds, fish, etc.

WORKSHEET FOR THE CLASS



DIGGING DEEPER

- Study the different soil organisms in the Soil Food Web.

DID YOU KNOW?

- There are more soil microorganisms in a teaspoon of healthy soil than there are people on Earth.
- The name for worm poop is 'castings'.
- Worms are like mini-farmers, turning the soil by bringing the organic matter from the top and mixing it with the soil below.
- Tunnels the worms create are important since they allow water and air to travel through the soil for the plant roots.

GARDENER'S TIP

- Here are some things students can do to create a happy home for worms in the garden: Take it slow when worms are first introduced, gradually increasing the amount of food provided. Supply the worms with a steady diet of protozoa, fungi, and other microbes by feeding the worms plenty of food waste and leaf litter (upon which these microbes grow.) Supplement the diet with crushed eggshells, an excellent calcium source that encourages worms to reproduce. Keep the worms protected from light.

NUTRITION FACTS

- Without adequate nutrition, especially minerals, people may develop chronic health conditions.

STANDARDS FOR LESSON 10 LESSON MAP

3-LS4 Biological Evolution: Unity and Diversity

3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

NG:3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.

3-LS3 Science and Engineering Practices

3-LS-4 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.OA.B.6 Understand division as an unknown-factor problem. For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.

LESSON 10 LESSON MAP

Lesson 10: Soil Food Web

Day 1

- Pose questions to class, ask for thoughts, state we will revisit questions at end of lesson.
- Activity 1: My Soil Food Web Diagram soil in journal

Day 2

- Pass out Soil food Web handout
- Research types of organisms on internet students take notes and have discussion

Day 3

- Yarn Web Game
- Teacher assigns students to an organism Play game

Day 4–10

- Students revisit game, work in groups to write down the role of each organism.

Day 10

- Students reflect by answering questions from the lesson (Assessment questions)

Garden Observation

- Students observe different organisms on the soil food web in the garden. They will try to locate at least one example for each organism (treasure hunt style).

Day(s) 2

Math

Organisms in Soil as Decomposers (unknown number in division)

Day(s) _____

GLL

Literary Elements

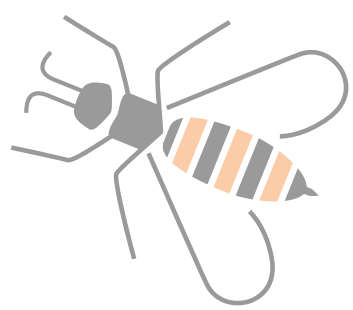
Literacy connection:

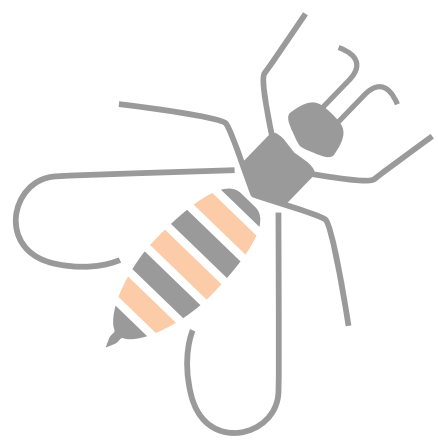
Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation





Name:_____

Date: _____

GARDEN ORGANISM TREASURE HUNT

Directions: Find one example for each organism and write it down next to the appropriate choice.

1. Soil _____

2. Bird _____

3. Anthropod Predator _____

4. Anthropod Shredder _____

5. Nematode fungal and bacterial feeder _____

6. Nematode Predator _____

7. Animals _____

8. Protozoa _____

9. Bacteria _____

10. Fungi _____

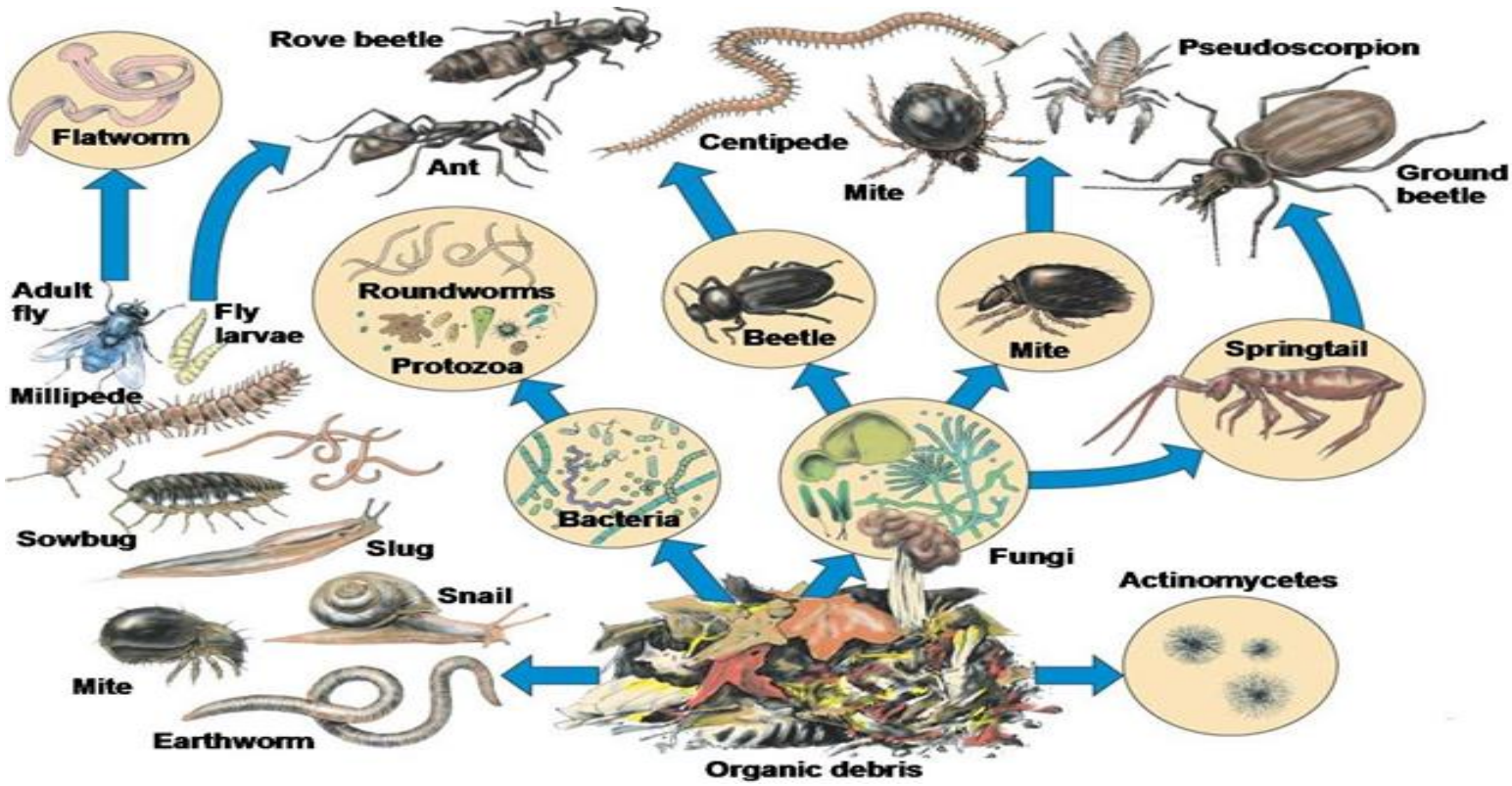
11. Organic Matter _____

12. Plants _____

Name:_____

Date: _____

ORGANISMS IN SOIL AS DECOMPOSERS



One teaspoon of compost can hold up to a billion bacteria!

1. Brianna added ____ cups of shredded leaves to the compost. If a there are ____ worms in the compost bin, how many cups of leaves would they eat get?

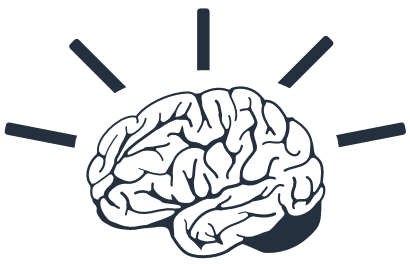
2. Mrs. Mendez's class was sifting through the compost and found ____ pseudo-scorpion legs in the compost bin. If each pseudo-scorpion has 6 legs, how many total pseudo-scorpions are in the bin?

3. There are ____ gallons of compost. We want to share the compost evenly between our ____ garden beds. How much compost will each garden bed get?

Bonus. Conduct your own experiment to see if a whole leaf or a torn leaf gets eaten and decomposed faster. Draw your observations throughout a week. Create your own division word problem to show your observations.

Lesson Eleven

Parts of a Worm



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OVERVIEW

Students will examine worms and their importance to healthy soil.

OBJECTIVE

- After the students have learned about organisms within the soil, students will inquire more about the earthworm.
- Students will be able to identify an earthworm and its parts.
- Students will also be able to discuss why the earthworm is essential to healthy garden soil.

STANDARD

Nevada State Standards

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

Next Generation Science Standards

3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exist in a group of similar organisms.

TEACHER INFORMATION

A worm is an invertebrates with a long cylindrical tube-like body with no legs. Worms vary in size from microscopic to over 1 meter in length. The type of worms that are typically associated with vermicomposting are ‘red wigglers’ aka Eisenia foetida. They are hermaphrodite, meaning they have two sex organs. These creatures have no bones, but they do require calcium in their system. They tend to be ‘surface dwellers” staying within 18 inches of the surface of the soil.They cannot see; however, they do have a light sensor. They prefer to stay away from the light altogether. They have no teeth, instead they have an organ similar to the chicken gizzard that uses small pits of grit to help grind up the food. They breathe though their skin and that is why their environment needs to be moist. A word of caution: they do not like to be immersed in water because they will drown. Have you ever seen worms on the sidewalk after it has rained or the landscape has been irrigated? They are trying to get away from all that water!

TIME

Part One: 30-45 minutes | Part Two: 30 minutes

QUESTIONS

- What are the parts of the earthworm?
- Why is the earthworm important to a garden?

MATERIALS

- Science journals
- Gummy worm for each student or one to two cups of live earthworms or night crawlers
- Large construction paper
- Wet glue
- Crayons
- 3x5 index cards (3 per student)
- Various earthworm books from the library (ensure books provide information about the parts of the earthworm and what the earthworm does)

PROCEDURE

Suggested grouping: approximately four students per group with about 5 books per group.

- Part One

1. Teacher will ask students what they know about the earthworm and write down information on the board using a 'defining in context' graphic organizer such as a circle map. Teacher should write the word earthworm in the middle circle and write down students' responses in the next outer circle. It is essential for teachers to complete the last outer layer, which informs others where the information was found.

2. After students have shared their knowledge about the earthworm, students will start the task. In their science journals, have students draw a picture of an earthworm. The teacher will provide five earthworm vocabulary words for the students to label on their drawn earthworm (clitellum, mouth, paired setae, prostomium, and segment). Students are to complete the following tasks when reading their earthworm books:

   - redraw their earthworm to ensure it has the correct parts.
   - label the parts (clitellum, mouth, paired setae, prostomium, and segment)
   - for students who like a challenge, have then dig deeper by providing the specific definitions of the parts of the worm. They may find this information on the internet or perhaps within the books provided for this activity.
   - find at least five important facts for why the earthworm is important to a garden and defend why using information from the text.

- Part Two

1. Using the gummy worm: Distribute white construction paper and a gummy worm to the each student. Have students glue the gummy worm onto their paper. While drying, the student can label the parts of the worm (clitellum, mouth, paired setae, prostomium, and segment). Again, students who require a challenge may add definitions of each.

    a. Using the live earthworm or night crawler: Distribute white construction paper to each student. Be sure to have a serious class discussion that worms are living creatures and need to be handled with care and respect. (*The live worms will also dry out quickly, so the students need to quickly lay out and trace the outline on their paper. You may want to have a bowl with moist soil for each table to put their worm into when they are done with the outline.) Place the worm carefully onto the paper. Students will loosely trace the outline of their worm on the paper. They can label parts of the worm (clitellum, mouth, paired setae, prostomium, and segment). After all their observations, drawings, and discussions, the students release the worms into the school garden or landscape.

    b. These are live worms that require moisture and very gentle handling to survive. The students should make their observations at the beginning, finding all five parts.

2. After students have labeled the gummy worms' or live worm parts, the student can then fully illustrate their white paper 'garden'. Encourage students to incorporate the organisms from the previous lessons.

3. After students have finished their illustration, have students write one important fact on their index cards. Student must write in a complete sentence as well as defend their thinking.

ASSESSMENT

Teacher will review construction paper projects. Teacher will ensure that all five components of the earthworm are correctly labeled. Teacher will also make sure that the students have listed three important functions that the earthworm performs that help keep the garden soil healthy.

ADAPTATIONS

Students can have a jar of garden soil containing a few real worms for observations. This will allow students to physically see and perhaps touch the earthworm as they read the books and make stronger connections.

You may also want to provide a diagram with the parts of the worm and have these students still find these parts in the books. This may be helpful as reading through grade level books may be challenging for these students.

In either their science journals or gummy worm project, have the students provide the specific definitions of the parts of the worm:

clitellum - the enlarged part of the earthworm that contains the reproductive parts; it produces the eggs. The clitellum is about one third of the way down the body from the head.

mouth - The cavity at the front of the earthworm through which the worm eats. The first segment, which contains the mouth, is called the peristomium.

paired setae - tiny bristles (or hairs) that occur in pairs on most segments; setae anchor the stationary segments as the worm moves forward and help the worm sense its environment.

prostomium - a tiny flap in front of the mouth.

segment - the earthworm's body is divided into over one hundred rings.

DIGGING DEEPER

- Have students imagine what it is like to be an earthworm. Ask them to close their eyes and notice how light enters through their eyelids. Worms sense light in this way, navigating away from the light. Have students imagine grinding food with rocks instead of chewing it with their teeth. Worms must do just that. They swallow rock particles along with their food, and then grind the food with these rock particles inside their bodies. Finally, ask each student to find his or her pulse. Have them imagine they have five heartbeats instead of one. Some worms have five hearts!
- Check out the Soil Green Box from DRI. Many hands-on experiments including all of the supplies needed are part of the box and a great extension to this unit of study.

DID YOU KNOW?

- Do you know how to tell the head from the tail of a worm? Look which way the worm is moving! The head of a worm is called anterior. The tail end of a worm is called posterior.
- Adult worms can have 120-170 segments to their body.
- If you look closely at a worm, you will see setae these are like tiny hairs that help them move through the soil.
- A worm breathes through its skin. They can drown if you put them in water or water the soil too much.
- Worms are are covered in slimy type of mucous to help them move through the soil.

NUTRITION FACTS

- Our diet should include sufficient amount of the minerals calcium, magnesium, potassium and the vitamins A, C, D and E to maintain good health.

STANDARDS FOR LESSON 11 LESSON MAP

NG:3-LS3-1 Analyze and interpret date to provide evidence that plants and animals have traits inherited from parents and that variation of these traits
exists in a group of similar organisms.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

LESSON 11 LESSON MAP

Lesson 11: Parts of a Worm

Day 1

- Teacher asks what students already know about the earthworm.

  Discuss, chart on circle map.
- Have students draw a picture of an earthworm with listed vocabulary words to label body parts.

Day 2

- Students begin reading earthworm books/redrawing their earthworm picture
- Find 5 important facts of why the earthworm is important to a garden

Day 3

- Construction paper glue gummy worm to paper.
- Label parts of the worm

Day 4

- Create garden of organisms around gummy worm on construction paper.

Day 10

- Students choose 3 important facts of the earthworm and write them in complete sentences on index cards.

Garden Observation

- Students observe key aspects that can be incorporated into their construction paper garden for their worm.

Day(s) 2

Math

Multiply/Divide worms

Day(s) _____

GLL

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) _____

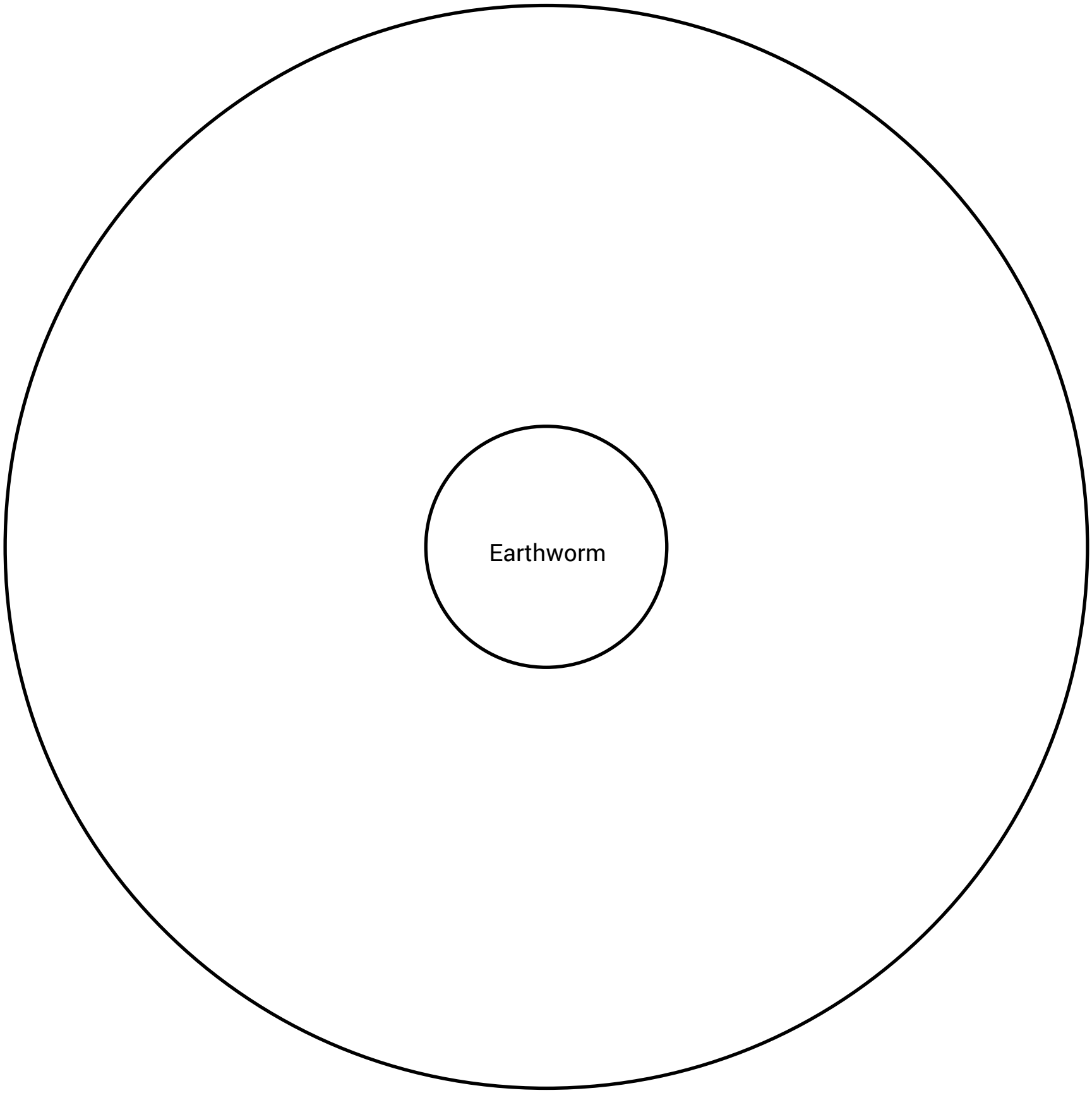
Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

EARTHWORM CIRCLE MAP



Name:_____

Date: _____

EARTHWORM DIVISION

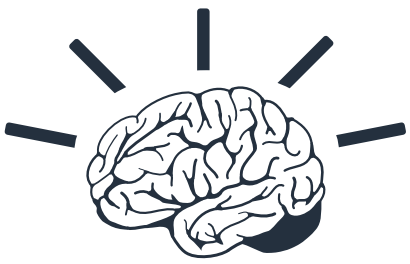
1. There are 49 worms living in the garden. If the garden separates the worms into equal groups, how many worms would the gardener have in each group?

2. There are 30 worm towers in Las Vegas Schools. If there are 11 worms in each tower how many worms are there in all of the towers?

3. There are 45 worms in the Crestwood Garden. 5 Students take some worms and move them into worm towers. If each student takes the same amount of worms, how many worms did each take?

Lesson Twelve

Life Cycle of a Worm



BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students will explore the life cycle of a worm.

OBJECTIVE

- Students will look more in depth into the worm by studying its life cycle.
- Students will be able to provide each phase as well as create a three dimensional model of what each phase looks like.

STANDARD

Nevada State Standards

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV (3)4.2 Investigate, compare, and contrast life cycles of various living things.

NV (3)4.3 Identify and compare needs common to most living things.

NV (3)4.4 Investigate, compare, and contrast identifiable structures and characteristics of plants and animals that enable them to grow, reproduce, and survive.

NV(3)4.6 Distinguish living from non-living according to established criteria (growth, reproduction).

Next Generation Science Standards

3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common, birth, growth, reproduction, and death.

3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exist in a groupd of similar organisms.

TEACHER INFORMATION

There are 2,700 different types of earthworms in the world. Worms are invertebrates (no backbone): other examples are insects, sea stars, spiders, millipedes. Earthworms have bilateral symmetry, meaning if you cut them down the centerline, each side would be identical. They have tiny bristle-like structures called setae. Setae helps the earthworms move through the soil. Speaking of moving through the soil, the outer layer(epidermis) of a worm secretes a mucous to help them move through the soil. Worms are *hermaphrodites*, meaning each worm has both male and female organs.

Worms mate by joining their clitella (swollen area near the head of a mature worm) and exchanging sperm. Then each worm forms an egg capsule in its clitellum. You can tell the adult worms by the clitellum around the middle. Worms can eat their weight each day. In 1 acre of good soil there can be 1,000,000 worms. Some of the largest worms can live to be 50 years old. A worm chopped in ½ will not become 2 worms: only the head end will regenerate.

TIME

Approximately 45 minutes

QUESTIONS

- What is the life cycle of the earthworm?

MATERIALS

- Science journals
- Play-Doh or 'homemade' play dough (Recipe below)
- Glue
- Paper plates

PROCEDURE

- Making Connections

1. Teacher will ask the students if they have ever studied the life cycle of an organism. Some students may make connections to the lifecycle of a meal worm or butterfly. In their science journals, have students work in groups to try to remember the lifecycle of these previously studied organisms. After time, teacher may want to make a general drawing of one of these organisms for the whole class to see. The teacher will take notice of what life cycle terms students are using to reinforce later in the lesson. (Pre-assesment of prior knowledge).

   The teacher informs the students they are going to study the life cycle of the worm. The student's task is to understand the different parts of the cycles and make connections to other life cycles as to their importance to organisms in general.

2. Teacher will distribute the attached life cycle sheet of an earthworm, paper plate, and enough Play-Doh for each student to create a few cocoons, a few hatchlings, and a few adult earthworms. Using the Play-Doh and life cycle sheet as a model, students will create each section of the cycle. They will glue a rendering of each phase onto the paper plate and also provide the label of that phase. Ensure students are using arrows to indicate the next phase.

3. In their science journals, students will discuss any connections they have made between the earthworm's life cycle and another life cycle previously discussed in class.

ASSESSMENT

Teacher will assess how well the student created his or her paper plate earthworm life cycle. It should also include the correct direction of the cycle as well as each phase.

ADAPTATIONS

Students go out into the garden to observe real worms. This will allow students to physically see and perhaps touch the earthworm as they read the book and make stronger connections. See if the students are also able to see these phases within the worm box or even within the garden soil.

Have students research the time frame of each life cycle as well as the life span of an earthworm. Ask students if earthworms have the same life cycle and life span as another similar looking organism, such as a slug or caterpillar. Have them deduce why they may be similar or different.

RECIPE FOR 'PLAY DOUGH'

3 cups flour

1.5 cups salt

6 tsp. cream of tarter

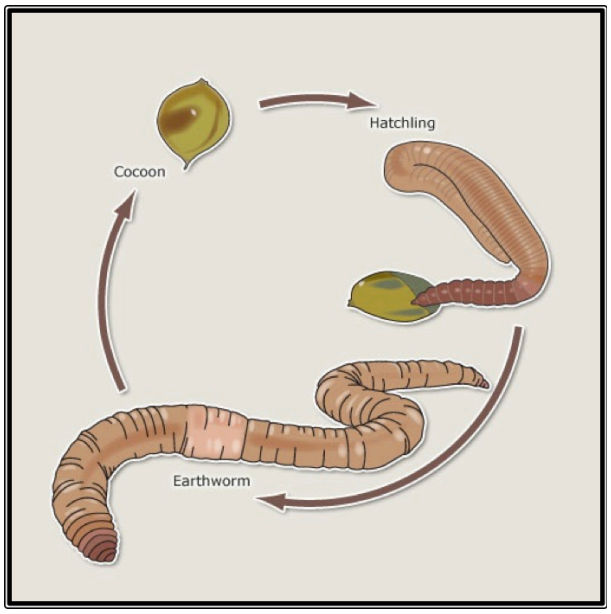
3 tbsp. oil

3 cups water

1. Pour all ingredients into a large pot.
2. Stir constantly over medium heat until a dough ball forms by pulling away from the sides.
3. Knead dough until the texture matches play dough (1-2 minutes).
4. Store in plastic container. Should last for at least 3 months.

Ideas: Divide into sections, then knead in food coloring (liquid or paste). Use unsweetened Kool-Aid for color and scent. Add glitter for sparkly play dough.

LIFE CYCLE OF AN EARTHWORM



DID YOU KNOW?

- Worms are more active in moist conditions because they are mostly made of water and must not dry out. However, baby worms need dry conditions to hatch. They might stay in their cocoons for years if outside conditions are not ideal.
- Worms often live to be about six years old in the wild. After hatching, they mature into adults in approximately one to 1.5 months. On a human scale, this would be like a person reaching adulthood when he or she was less than two years old!

NUTRITION FACTS

- Produce can be called organic if it's certified to have grown on soil that had no prohibited substances applied for three years prior to harvest.

STANDARDS FOR LESSON 12 LESSON MAP

NG:3-LS3-1 Develop models to describe that organisms have unique and diverse life cycles but all have common, birth, growth, reproduction, and death.

3-LS3-1 Analyze and interpret date to provide evidence that plants and animals havetraits inherited from parents and that variation of these traits exists in a group of similar organisms.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.OA.D.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

LESSON 12 LESSON MAP

Lesson 12: Life Cycle of a Worm

Day 1

- Teacher asks if they have ever studied the life cycle of an organism.
- Students make connections.
- Students work in groups to try and remember the life cycle of a previously studied organism.
- Teacher draws general drawing of a life cycle on the board.
- Teacher informs they will study the life cycle of the worm.

Day 2

- Teacher passes out life cycle sheet.
- Students create cocoons with supplied materials.
- Glue to plate.

Day 3

- Continuation from previous day.
- Students will make connections with the earth's life cycle and a previous organisms life cycle in their science journal.

Garden Observation

- Students observe real worms in the garden to make stronger connections. Students look to see if they can find the phases within the worm box or garden soil.

Day(s) 2

Math

Worm word problems

Day(s) _____

GLL

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

EARTHWORM LIFE CYCLE
COMPARE/CONTRAST DOUBLE BUBBLE

Directions Create a double bubble compare/contrasting the life cycle of an earthworm with an organism from a previous lesson.

Name:_____

Date: _____

LIFE CYCLE OF A WORM 2-STEP WORD PROBLEMS

1. A worm was 150 millimeters long. Now it is 357 millimeters long. How much did the worm grow?

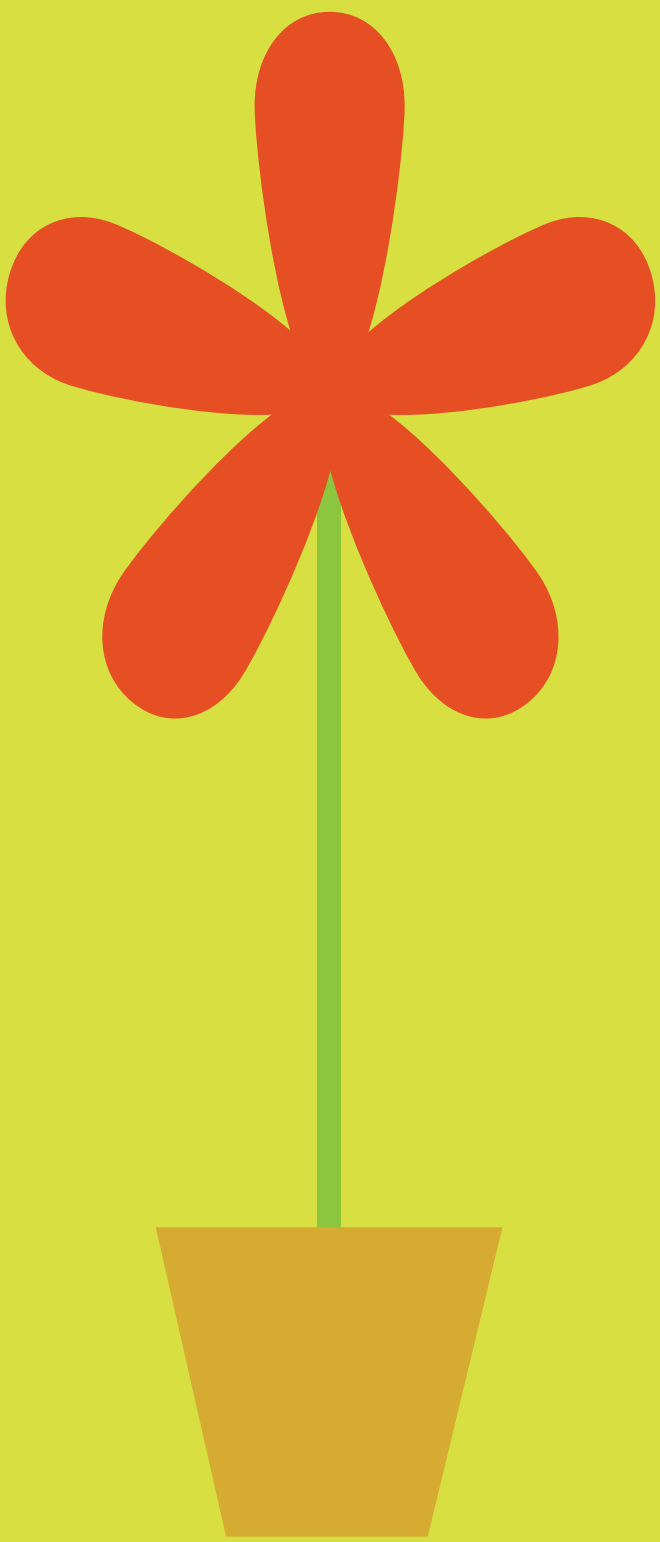
2. A worm is 245 millimeters long. Half of the worm's body is in the soil. How much of the worms body is above the soil?

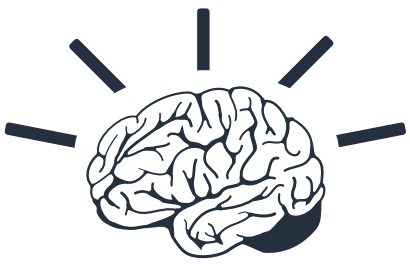
3. A worm has 8 babies. Each worm has 5 babies in the dirt. How many babies are there in the dirt total?

4. The teacher has 10 groups of worms in her worm tower. Each group has 4 worms in it. How many total worms are in the worm tower?

Lesson Thirteen

Life Cycle of a Flowering Plant





BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

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OVERVIEW

Students will learn the life cycle of a flowering plant and compare the cycle to the life cycle of other organisms.

OBJECTIVE

- Students will learn the stages within the life of a plant.
- Students will compare the life cycle of a flowering plant to the life cycle of another organism.
- Students will understand the concept of a life cycle.

STANDARD

Nevada Standards

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV (3)4.2 Investigate, compare, and contrast life cycles of various living things.

NV (3)4.3 Identify and compare needs common to most living things.

NV (3)4.4 Investigate, compare, and contrast identifiable structures and characteristics of plants and animals that enable them to grow, reproduce, and survive.

NV(3)4.6 Distinguish living from non-living according to established criteria (growth, reproduction).

Next Generation Science Standards

3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common, birth, growth, reproduction, and death.

3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exist in a groupd of similar organisms.

TEACHER INFORMATION

There are an estimated 350,000 species of plants in the world, and approximately 250,000 of those plants have flowering parts of one kind or another. The main reason for the flower is for reproductive purposes. The petals are usually the showy parts of the flower that are used to attract the pollinator either by the color or by the fragrance.

The receptacle is the area where the flower attaches to the stalk. After pollination, the receptacle often becomes part of the fruit that is produced by the flower (ex: the strawberry). The stalk of the flower is known as a peduncle. Its purpose is to support the flower when it elevates itself to attract pollinators. The nectary contains the nectar of the flower. The sepal is located just underneath the flower, right above the stalk. Sepals typically look like small leaves just under the petals. Their purpose is to protect the bud of the flower until it grows into a flower. (See image below)

TIME

Approximately 60 minutes

QUESTIONS

- What is the life cycle of a flowering plant?
- How are the life cycles of a flowering plant and an earthworm different and similar?

MATERIALS

- Science journals
- 3x5 construction paper or 3x5 index cards
- Large construction paper
- Glue
- Access to Discovery Education (discoveryeducation.com) for the video *Plant Life Cycle* (20 minutes)
- Introduction to the Plant Life Cycle on YouTube https://www.youtube.com/watch?v=-GgWRnUMAwM
- ** Any video featuring the life cycle of a flowering plant should suffice.

PROCEDURE

- Making Connections

1. Teacher will ask the students to review their diagram of the earthworm's life cycle, discussing briefly the three phases of the worm life cycle. Teacher will inform the students they are going to learn about a flowering plant's life cycle and make connections between the earthworm and flowering plant's life cycle.
2. Teacher will ask students what they know about the different stages of a flowering plant. In their science journals, students will try to create their own flowering plant life cycle. Encourage students to draw their cycle as a circle (as this is what a cycle is); if students can name a few phases, have them share.

3. Teacher will show a video from discoveryeducation.com or *Plant Life Cycle* or the YouTube video, *Introduction to the Plant Life Cycle*. Students are to watch the videos, making notes for any necessary changes to their plant life cycle diagrams they drew within their journals. After the video is over, have the student make their changes and discuss what they got correct and what they needed to add. Encourage students to share the phase(s) they may have missed and why it's important to the plant's life cycle.

4. Teacher will distribute the 3x5 construction paper and large construction paper. Have students chose a variety of different flowering plants. Students are to use the necessary number of cards correlating to the phases of the flowering plant. On each card, students will draw a picture of that particular phase, and will provide the term for that phase, as well as the purpose of that phase. Students will then glue the phases in order and share their projects with the class.

5. In their science journals, students will compare and contrast the life cycles of the flowering plant and the earthworm. A comparing and contrasting graphic organizer, such as the Double-Bubble map or Venn diagram, is a good visual for this task.

6. Have students go out into the garden and examine the flowers and compare the real flowers to the diagrams they've drawn in their science journals.

ASSESSMENT

Teacher will assess how well the students created their flowering plant life cycle projects. Teacher will also assess how well the students are able to compare and contrast the life cycle between the flowering plant and earthworm.

ADAPTATIONS

Provide students with the diagram below as they watch the video so they have a permanent visual in front of them. They may also want to use this as they create their flowering plant life cycle diagrams.

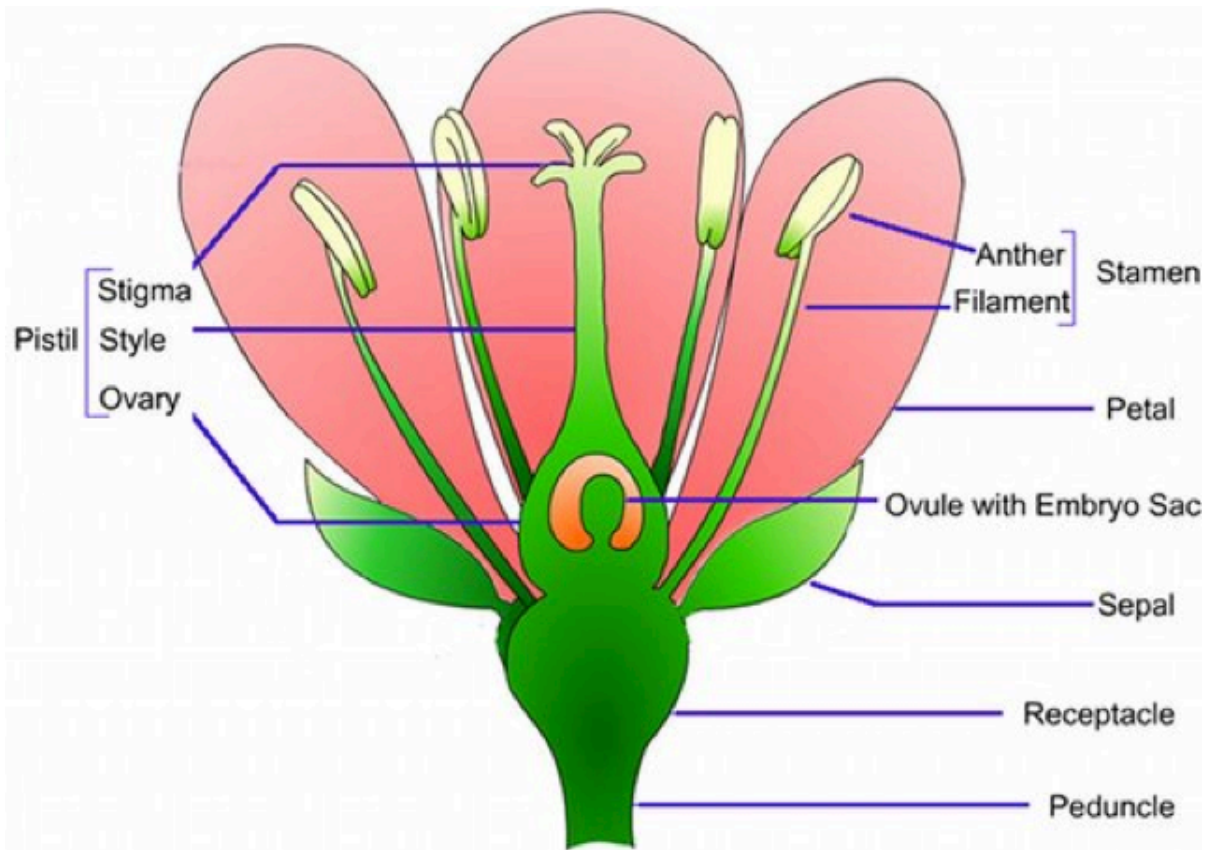
Have students research the life cycles of other types of flowering plants such as cacti or trees. Have them compare and contrast this new information with the knowledge from the video. Students can research the following:

- Which animals are pollinators?
- What colors attract bees, hummingbirds, moths, butterflies, or other pollinators?
- How does the shape of the flower affect pollination?
- How does pollen differ between plants?

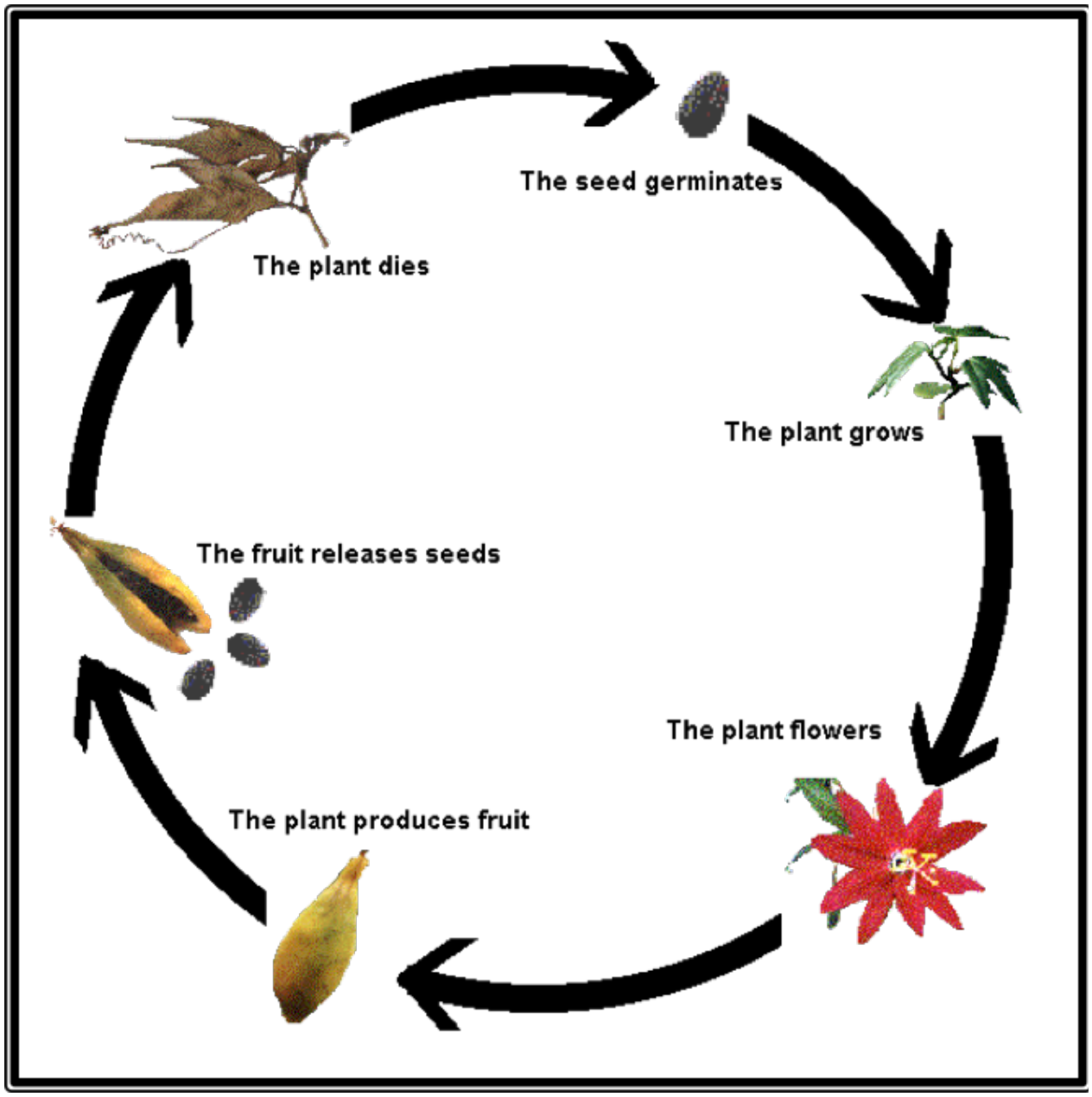
Check out this website: https://www.youtube.com/watch?v=NeX6ST7rexs

PARTS OF A FLOWER

Check out this website: https://www.youtube.com/watch?v=NeX6ST7rexs



LIFE CYCLE OF A FLOWERING PLANT



DIGGING DEEPER

- Students can observe the flowering plant life cycle at home by growing an annual flowering plant from seed. Have them ask a gardener for a small amount of soil and seasonally appropriate seeds. The seeds can be planted in a used container, such as a juice box, with holes pierced in the bottom. Have the students press seeds into the soil, sprinkle soil over them, and water them in gently. Set the container outside. Students should continue to water regularly and watch their seeds sprout, grow leaves, and flower. Ask them to monitor their plants and notice if pollinators visit. At the end of the plant's cycle, students may be able to collect seeds to plant next spring.

DID YOU KNOW?

- The life cycle of a flowering plant can play out over short periods or long ones. Some species of desert wildflowers are among the shortest-lived plants on Earth. They sprout, bloom, set seed, and die all within a period of weeks, when rain falls in the desert. The Mojave Desert is also home to some of the longest-lived plants. One clonal creosote bush is estimated to be 11,700 years old!
- Not all plants are flowering plants. Here are some common non-flowering plants: Mosses, ferns, green algae, pine trees, and sagos.

NUTRITION FACTS

- Worms help to aerate soil and allow air, water, and nutrients promoting plant growth.

STANDARDS FOR LESSON 13 LESSON MAP

NG:3-LS3-1 Develop models to describe that organisms have unique and diverse life cycles but all have common, birth, growth, reproduction, and death.

3-LS3-1 Analyze and interpret date to provide evidence that plants and animals havetraits inherited from parents and that variation of these traits exists in a group of similar organisms.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.OA.D.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

LESSON 13 LESSON MAP

Lesson 13: Life Cycle of a Flowering Plant

Day 1

- Teacher asks students to draw a diagram of the earthworm's life cycle.
- Teacher informs students that they will learn about a flowering plant's life cycle.

Day 2

- Teacher asks students to try to create the life cycle of a flowering plant in their science journal.

Day 3

- Show discoveryeducation .com video in attached lesson.
- Students make notes for necessary changes to their plant life cycle diagram they drew.
- Students discuss what they got right and what changes need to be made.

Day 4

- Students draw phases of various plants on construction paper.

Day 5

- Students compare and contrast the life cycles of an earthworm and a flowering plant using a Double Bubble Thinking Map.

Garden Observations

- Students choose a flowering plant in the garden.
- They will diagram the life cycle of the plant in their journal.

Day(s) 2

Math

Classroom Activity Sheet 3

Day(s) _____

GLL

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

LIFE CYCLE OF A FLOWERING PLANT

Directions Create a life cycle of a flowering plant to the best of your abilities. Then after watching the short video, edit your flowering plant to show what you learned from the video.

Name:_____

Date: _____

OUTDOOR CLASSROOM ACTIVITY SHEET 3

By Vincent D Ortiz

Farmer Alex wants to plant a whole garden at Crestwood, but he first needs to figure out how much of each seed he can plant. Help him figure out how many seeds he can plant.

There are 6 raised garden beds for Farmer Alex to use for plants. He wants to plant a different number of seeds in each bed, and he always plants them in perfect rows and columns. Below is Farmer Alex's plan for each bed.

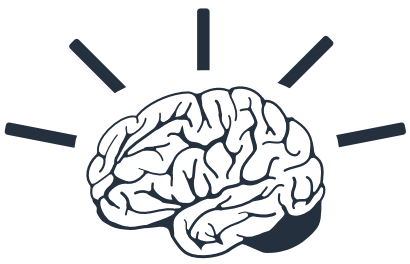
Bed	Number of Seeds
Bed 1	12
Bed 2	30
Bed 3	15
Bed 4	50
Bed 5	10
Bed 6	35

Below, draw the 6 raised beds and use arrays to show Farmer Alex how to plant the seeds.

What would your drawings look like if Farmer Alex wanted to plant DOUBLE the seeds from his original plan?

Lesson Fourteen

Life Cycle of a Bee



BRAIN BREAKS!

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2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students will learn the life cycle of a bee. Students will compare and contrast with the life cycles of other organisms.

OBJECTIVE

- Students will learn the phases within the life of a bee.
- Students will compare the life cycle of a bee to a life cycle of another organism.
- Students will understand the concept of a life cycle.

STANDARD

Nevada State Standards

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

NV (3)4.2 Investigate, compare, and contrast life cycles of various living things.

NV (3)4.3 Identify and compare needs common to most living things.

NV (3)4.4 Investigate, compare, and contrast identifiable structures and characteristics of plants and animals that enable them to grow, reproduce, and survive.

NV(3)4.6 Distinguish living from non-living according to established criteria (growth, reproduction).

Next Generation Science Standards

3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common, birth, growth, reproduction, and death.

3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variations of these traits exist in a group of similar organisms.

TEACHER INFORMATION

Bees are closely related to wasps and ants. Many bees live in communities called ‘hives’ while there are bees that are solitary; for example the mason bee. Bees are dependent on pollen as a source of protein and nectar from flowers as a source for energy. The adult females collect the pollen to feed their larvae. In the process of going from flower to flower collecting the pollen, they lose some of the pollen in other flowers. This action is called pollination. Bees are the most important of the pollinating insects. In fact one third of the food we eat is due to pollination by bees.

TIME

Part 1: Approximately 30 minutes | Part 2: Approximately 45 minutes

QUESTIONS

- What is the life cycle of a bee?
- How are the life cycles among an earthworm, flowering plant, and a bee different and alike?

MATERIALS

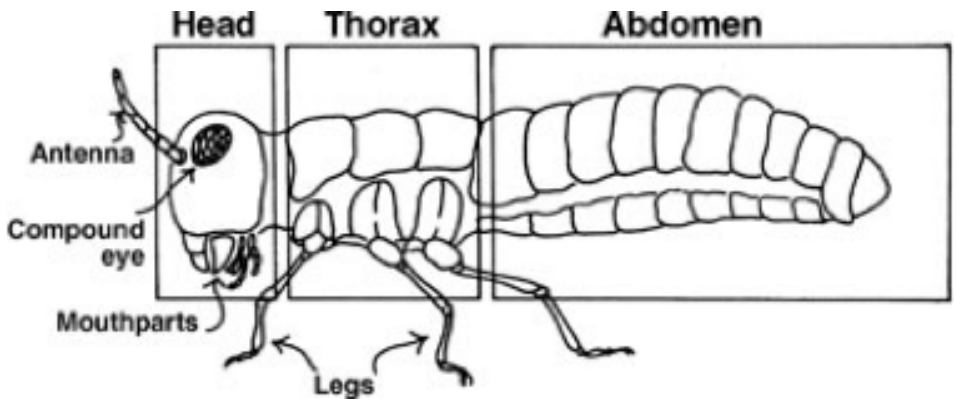
- Science journals
- Bee Life Cycle Printouts (See Below)
- Suggested reading: A Reason for a Flower by Ruth Heller

PROCEDURE

- Part 1

1. Making Connections: Teacher will ask the students to get into groups of four or so. Designate a group to be either a group that will act out the earthworm's life cycle or the flowering plant's life cycle. Provide time for the groups to create their demonstrations. Have groups act out their organism's life cycle. Have the other students provide any feedback to ensure the groups provided all the necessary steps for that particular life cycle.

2. Insect Parts Review-Connection to the bee: Teacher will ask if the students know the parts of an insect. In their science journals, students will draw an insect and label its parts. Students will share their information and others will make any necessary changes to their diagrams. The following is a general major component diagram for an insect.



3. Students will discuss the purpose of each major component of the insect.

4. In their journals, the students will draw their own version of a bee and label the major components using their insect diagram as a guide.

Part 2 : Lesson Tasks

1. The teacher will inform the students that the bee has four major phases in its life cycle, just like other insects. Do they remember those four phases (egg, larva, pupa, and adult)? The teacher will introduce the term complete metamorphosis and explain that it means the form of the organism changes a lot from larva to adult. Ask students if they can think of other organisms that undergo a complete metamorphosis (butterfly). Ask students if they know where bees live and what their group is called (hive).

2. The teacher will have the students get into groups of three. The teacher will provide each group a card to read and act out/present the information. Provide students with time to familiarize themselves with the text and practice their presentation.

3. Students will present their information to the class. The class should be writing notes within their journals. It would be a good idea for all students to draw each phase as well as any nuances occurring.

4. In their own science journals, students will re-create the life cycle of the bee. Students will also provide a complete thought when discussing what is occurring at each stage. Students will also provide a short discussion providing the differences and similarities between the life cycles of the earthworm, flowering plant, and a bee.

5. Have students go out into the garden and see if they can observe a bee. Compare the real bee to their drawing of a bee in their notebook.

ASSESSMENT

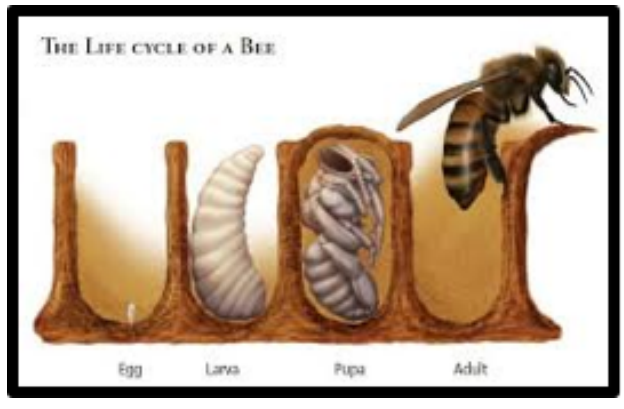
Teacher will assess how well the students provide information as they create a diagram of the bee's lifecycle within their science journals. Students are also assessed on making connections between the life cycle of the earthworm, a flowering plant, and a bee.

ADAPTATIONS

Provide a drawing of each card to allow students to fully understand the process of the bee's life cycle. Provide students the Life Cycle of a Bee printout information ahead of time so they become experts.

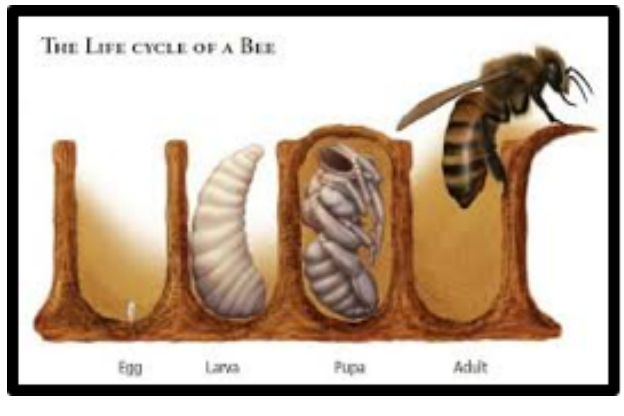
Have students research the life cycles of other insects found within the garden. Consult **Lesson 9-Soil Food Web** for other insects found within the garden. Do they go through the same complete metamorphosis as a bee?

LIFE CYCLE OF A BEE PRINTOUTS



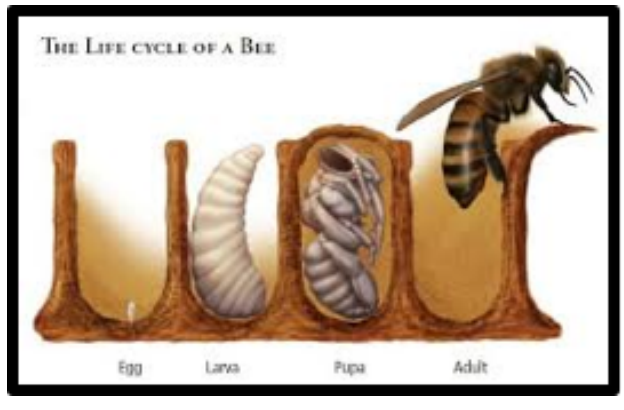
Card One: Egg Stage

The queen bee inserts her abdomen into an empty cell and lays a soft, white, oval egg about the size of a dot over an “i”. Eggs develop into different types of bees based on what they’re fed, and whether or not they were fertilized. The fertilized eggs become female worker bees and new queens. The queen can also lay some unfertilized eggs, which produce the drones.



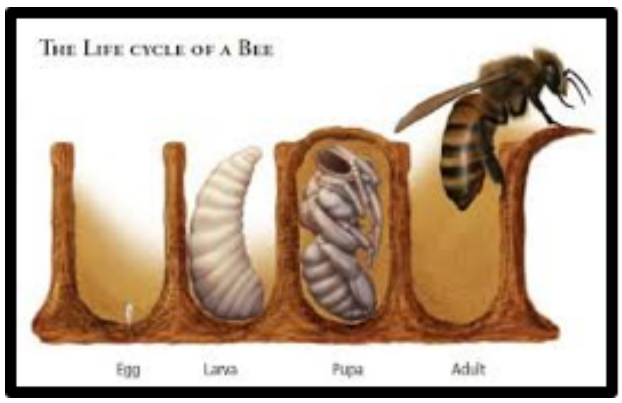
Card Two: The Larva Stage

The egg hatches into a larva after three days. The larva is a legless grub that looks like a tiny white sausage. The larva is fed by worker bees and grows much larger. If the larva is going to become a queen Bee, it is fed royal jelly for the entire larval stage. Worker bee larvae are fed royal jelly for three days, then they are fed beebread for the remaining larval stage. Drones (male bees) are also fed royal jelly for three days and then fed beebread.



Card Three: The Pupa Stage

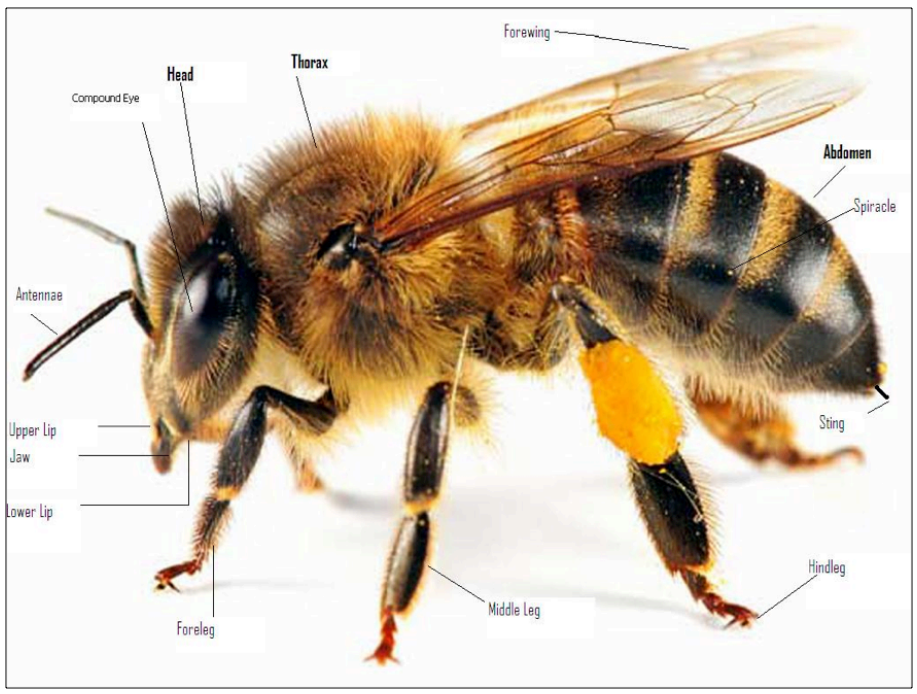
On day ten, the cell the larva is inside is capped with wax by a worker bee to protect it. The larva stops eating and spins a silk covering called a cocoon around itself. Inside the cocoon, a pupa develops and begins to look more like a bee than a worm. It grows eyes, legs and wings. On the twenty-first day, an adult bee chews its way out of the cell.



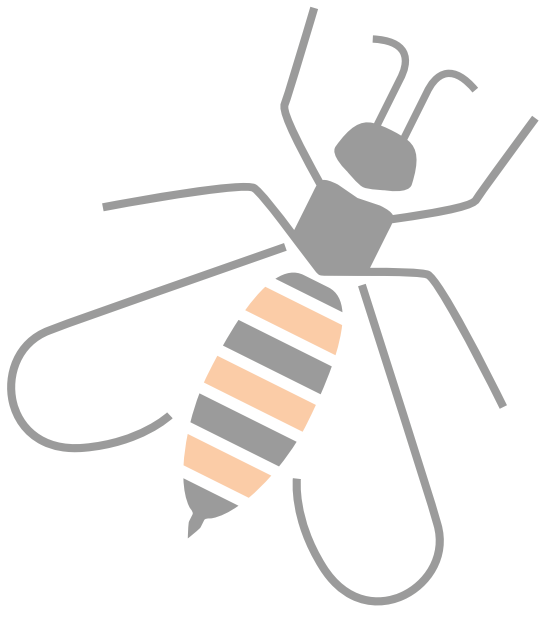
Card Four: The Adult Stage

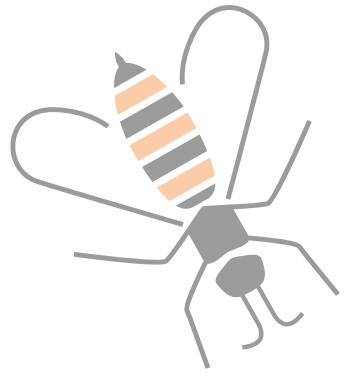
The worker and drone bees will do manual work all of their lives. A few worker bees, if fed a special diet of royal jelly during development, will develop into new queens.

PARTS OF A BEE



From: http://www.roysfarm.com/honey-bee-body-parts/





DIGGING DEEPER

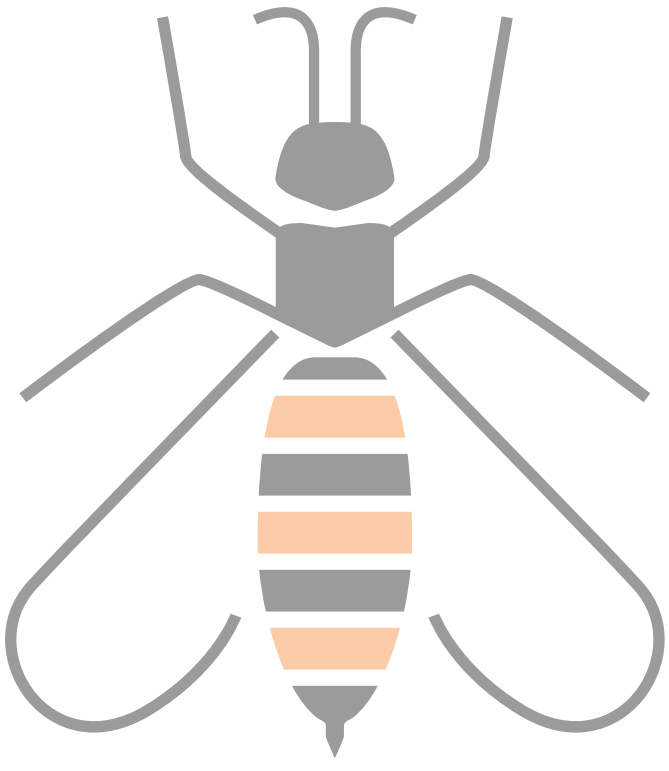
- Have students observe how the life cycle of a bee overlaps with the life cycles of the flowering plants the bee pollinates. Ask them to draw the life cycles side by side, noting the relationships between them.
- Have students compare the life cycle of a bee to the life cycles of other garden critters, such as a grasshopper, a ladybug, a tomato hornworm, a praying mantis, and a squash bug.

DID YOU KNOW?

- Each desert creature has a uniquely fascinating life cycle. Female rattlesnakes give live birth to their young, rather than laying eggs like other reptiles. A mother scorpion cares for her babies, carrying them on her back. Bats hang onto their mothers, too, as the mothers fly around foraging for food at night.
- The desert environment affects the life cycles of edible plants in the garden. The same plant that would die in October in other climates may have many more productive months in a desert garden, where killing frost might come as late as December or January…or not at all!

NUTRITION FACTS

- Bees are a key part of the ecosystem, providing antimicrobial and antioxidant properties.



STANDARDS FOR LESSON 14 LESSON MAP

NG:3-LS3-1 Develop models to describe that organisms have unique and diverse life cycles but all have common, birth, growth, reproduction, and death.

3-LS3-1 Analyze and interpret date to provide evidence that plants and animals havetraits inherited from parents and that variation of these traits exists in a group of similar organisms.

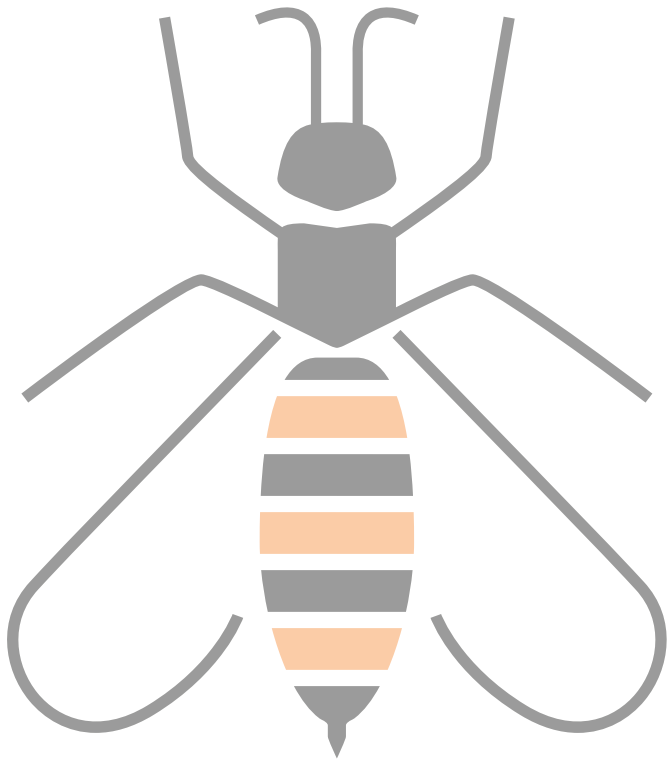
ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.OA.D.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.



LESSON 14 LESSON MAP

Lesson 14: Life Cycle of a Bee

Day 1

- Students in groups of 4 will recreate the cycle of an earthworm or flowering plant using their bodies.
- Other students give feedback.

Day 2

- Teacher asks students if they know parts of an insect.
- Students draw an insect and label its body parts in their journal.
- Students discuss major components of the body with partners.

Day 3

- Students create their own version of a bee in their journal and label the body parts using the insect diagram as a guide.

Day 4

- Teacher reviews bug's life cycle and introduces metamorphosis.
- What other bugs go through this stage?
- Where do bees live?

Day 5

- Students get into groups of 3.
- Students will create a phase by acting/presenting.
- Students draw each phase in their journals.

Day 6

- Students recreate the life cycle of the bee in their journals.

Garden Observation

- Students try to observe a real bee in the garden.

Day(s) 2

Math

Bee Word Problems

Day(s) _____

GLL

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

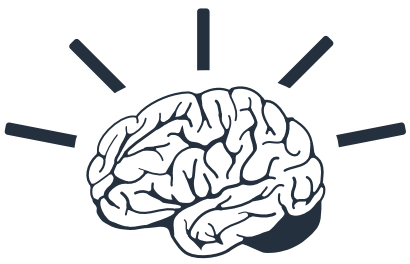
1. Bees can pollinate up to 5,000 flowers a day. A bees comes into our garden and pollinates 155 flowers in our garden, this same bee has pollinated 587 flowers today before visiting our garden. What is the total number of flowers this bee has pollinated today?

2. Look at the total number of flowers the bee in problem number 1 pollinated. About how many more flowers would this bee need to pollinate to have pollinated 5,000 flowers?

3. Our school was visited by 400 bees yesterday. If we plant new flowers that attracted twice as many bees how many bees will we get today?

Lesson Fifteen

Pollination



BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students learn about the importance of pollination and the connection to the food we eat.

OBJECTIVE

- Students will understand the concept of pollination and how it works.
- Students can name pollinators and explain their job in plant reproduction.
- Students will identify parts of a flowering plant.

STANDARD

Nevada State Standards

NV(3)1.5 Use science notebook entries to develop, communicate, and justify descriptions, explanations, and predictions.

NV(3)1.6 Create and use labeled illustrations, graphs, and charts to convey ideas, record observations, and make predictions.

NV(3)3.1 Investigate and describe that the Etarth is composed of different kinds of materials (rocks, soil, water, air).

NV(3)3.3 Determine and explain that soil varies from place to place and has biological and mineral components.

NV (3)4.3 Identify and compare needs common to most living things.

NV(3)4.6 Distinguish living from non-living according to established criteria (growth, reproduction).

Next Generation Science Standards

3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common, birth, growth, reproduction, and death.

3-LS2-1 Construct an argument that some animals form groups that help members survive.

3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

TEACHER INFORMATION

Pollination is the process of pollen from the stamen (male part of the flower consisting of the filament and the anther) finding its way to the pistil (female part of the flower consisting of the stigma) and traveling down to reach the egg. Pollination must happen for flowering plants to reproduce. Wind, water, bees, butterflies, other insects, and various animals can transfer pollen to other flowers.

TIME

Approximately 30-60 minutes

QUESTIONS

- What is pollination?
- How does pollination aid plant reproduction?
- Who or what are pollinators?
- Which parts of a flowering plant are aiding in pollination?

MATERIALS

- Science Journals
- Pollinator Headwear -1 per student
- Flower Headwear-1 for each flower (need 2 or more flowers)
- Cups
- Straws
- Cotton balls
- Double-sided Tape

PROCEDURE

1. Watch and discuss the video from discoveryeducation.com on YouTube (This is a great video that explains pollinators and how pollination works): https://www.youtube.com/watch?v=6CxCTyxRFh0

2. Give students a bee, butterfly, or moth headwear. (Prepare ahead of time or have students make. Print pictures (see below) and have students cut out, color accurately, and glue on strips of construction paper cut to fit the circumference of their head.)

3. Students put on headwear.

4. Give students a straw (proboscis) and a strip of double-sided tape stuck to their arm (pollen will stick to this).

5. Teacher and helper put on flower headwear to show they are the flowers.

6. The flowers hold a cup (representing nectar) and cotton balls (representing pollen).

7. Students line up in front of the “flowers” and use their ‘proboscis’ to take a sip of the ‘nectar’ from the cup.

8. The ‘flower’ sticks a cotton ball on the tape on the student arms, tell them that pollen just got stuck to them.

9. The students then go to the other flower. There, they take another sip of nectar and the other flower takes the ‘pollen’ that was stuck to the students’ arms. They successfully pollinated the flower.

10. Students continue visiting the flowers, pollinating and sipping nectar.

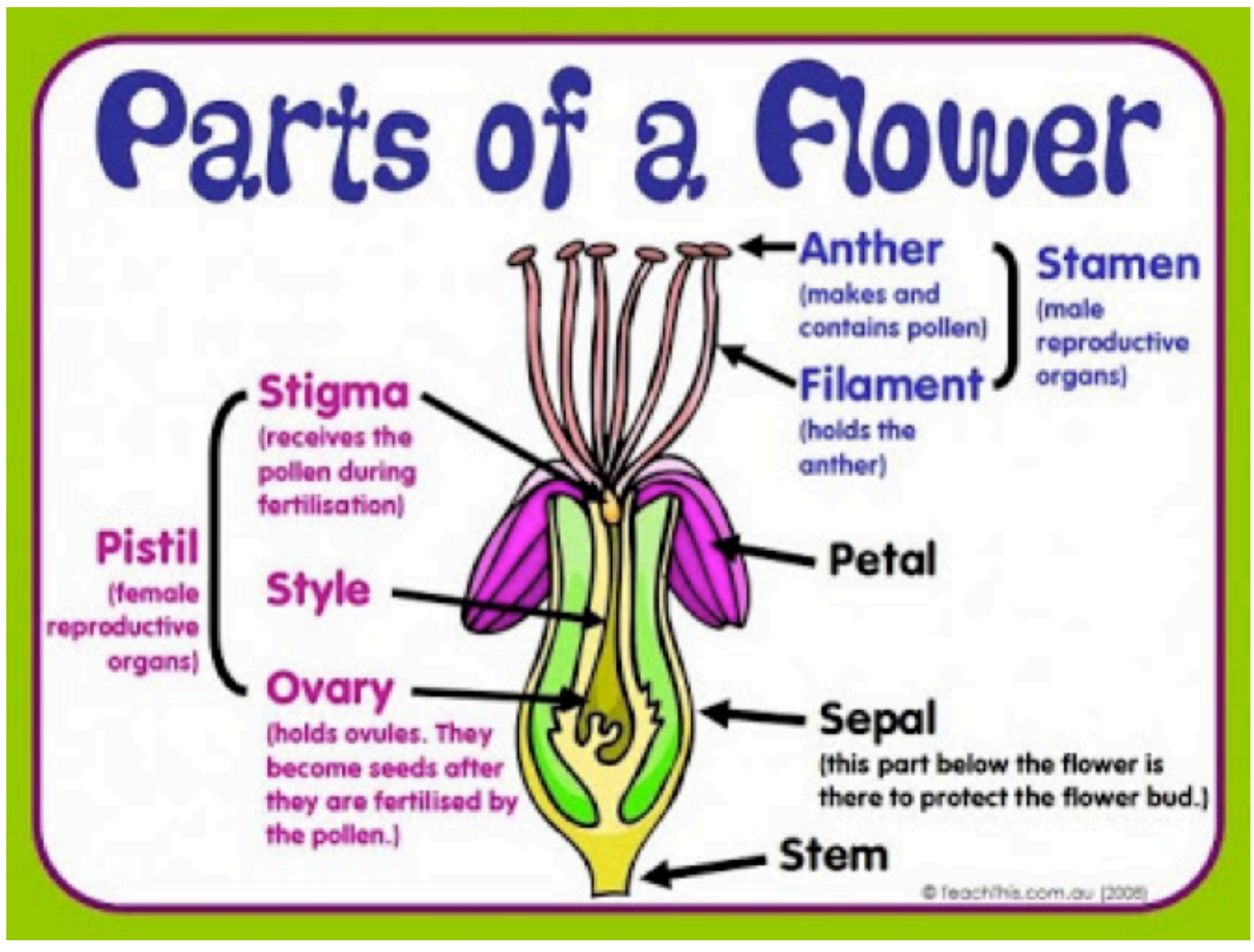
ASSESSMENT

Students will make a picture showing how pollination works and label the parts.

ADAPTATIONS

Students will act out how pollination takes place, explaining what is happening and by whom. Suggested paired reading: The Life Cycle of a Bee by Collen Sexton and The Bee Treeby Patricia Polacco

Students make a diorama showing the process of pollination.



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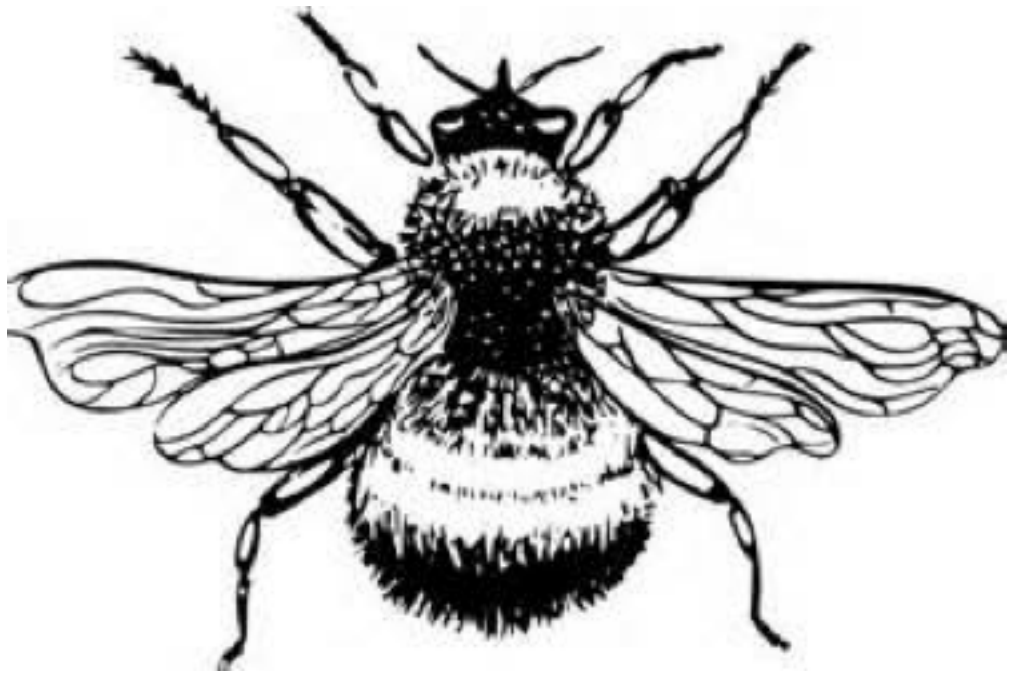
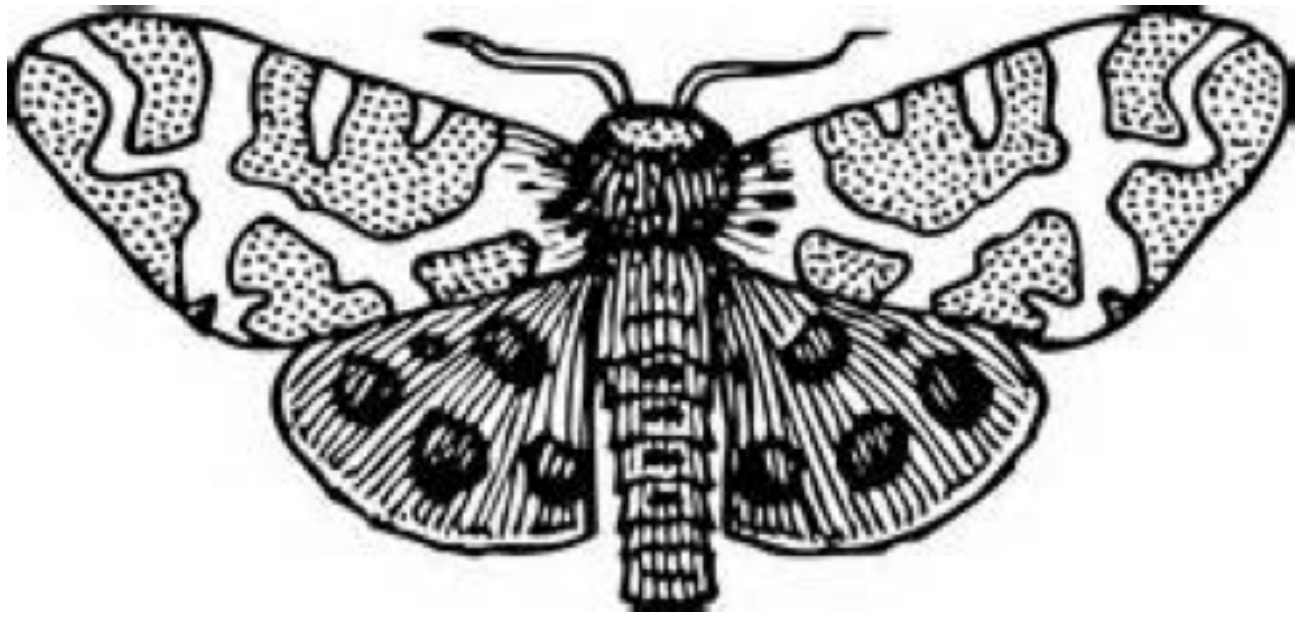


www.coloring-pages-kids.com



DIGGING DEEPER

- Ask students, what is the purpose of pollination? Why do flowering plants need to be pollinated?

DID YOU KNOW?

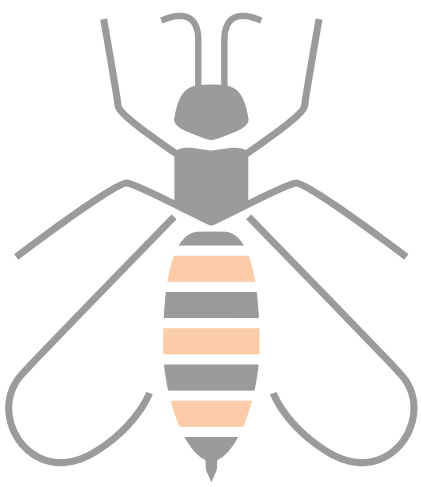
- Some desert pollinators are rarely observed because they are active at night. These include the moths that pollinate yucca flowers and the bats that pollinate saguaro cacti.

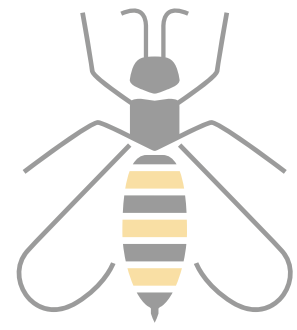
GARDENER'S TIP

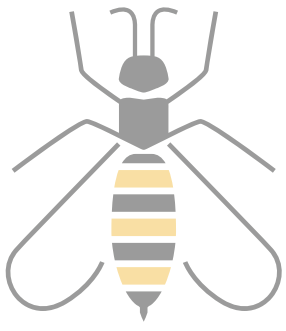
- Students can be pollinators, just like bees. When students notice a veggie plant in bloom, have the students lightly dust the flowers with a natural-fibered paintbrush or Q-tip. Ask them to move from flower to flower performing this dusting motion. If there are many plants of the same type, students can dust all of them. They are helping the bees and other pollinators spread pollen!

NUTRITION FACTS

- Natural pollinators, such as bees and butterflies, account for between 5% and 10% of the agricultural production of food crops.







STANDARDS FOR LESSON 15 LESSON MAP

NG:3-LS3-1 Develop models to describe that organisms have unique and diverse life cycles but all have common, birth, growth, reproduction, and death.

3-LS3-1 Analyze and interpret date to provide evidence that plants and animals havetraits inherited from parents and that variation of these traits exists in a group of similar organisms.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.NBT.A.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

LESSON 15 LESSON MAP

Lesson 15: Pollination

Day 1

- Watch the video on pollination on discoveryeducation.com.
- Discuss pollination with the class.

Day 2

- Give students bee, butterfly or moth headwear.
- Print pictures (with lesson) and have students cut out, color and accurately glue on strips of construction paper.

Day 3

- Students put on headwear.
- Use listed materials for students to go around the class pollinating flowers.

Day 4

- Students make a picture in their science journal showing how pollination works and label the parts.

Garden Observation

- Students choose a flower in the garden and recreate it in their journal and diagram the parts.

Day(s) 2

Math

Flower Multiplication

Day(s) _____

GLL

Literary Elements

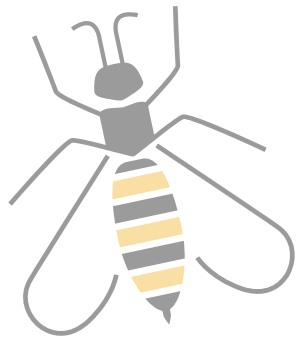
Literacy connection:

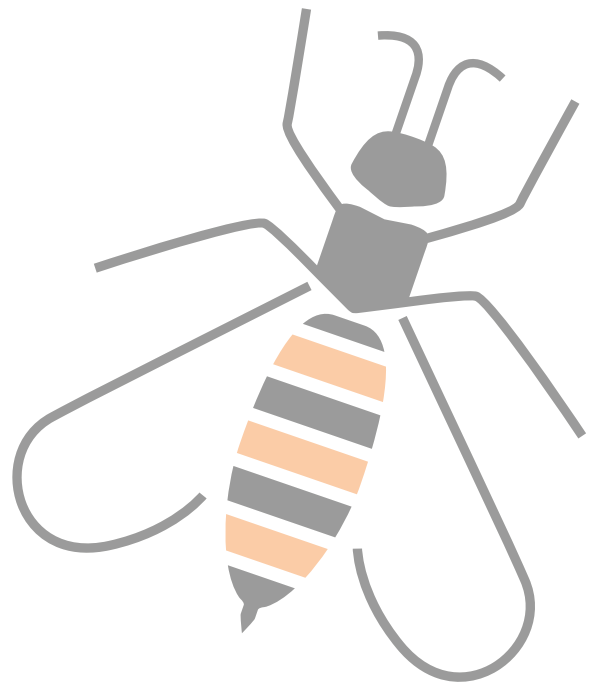
Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation





Name:_____

Date: _____

POLLINATION VIDEO KWL CHART

What I Know About Pollination	What I Want to Know About Pollination	What I Learned About Pollination

Name:_____

Date: _____

BEES MULTIPLES OF TEN MULTIPLICATION

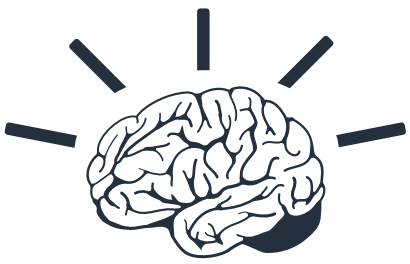
1. There are 20 bees in the hive. Each hive pollinates 5 flowers. How many flowers were pollinated all together?

2. There were 40 bees pollinating flowers in the garden. Each bee pollinated 10 flowers. How many flowers were pollinated all together?

3. There were 80 bees pollinating flowers in the garden. Each bee pollinated 2 flowers. How many flowers were pollinated all together?

Lesson Sixteen

Building Bee Boxes



BRAIN BREAKS!

1. Plant Partners Teacher will give class a plant part (seed, root, stem, leaves, flower). Students turn to a partner and go back and forth naming vegetables harvested from that part of the plant. Repeat until partners can no longer name vegetables from that plant part.

2. Apple, Watermelon, Banana (rock, paper, scissors) Students play rock, paper, scissors replacing rock with apple, paper with watermelon and scissors with banana. Play as many rounds as possible in given time frame.

3. Garden Taboo Teacher plays music. When music stops students pair up. Teacher calls out a garden topic such as fruit. Partner A has to describe any fruit they want to their partner without saying the name. Partner B has to try and guess what their partner is describing.

4. Syllable Snacks Teacher will call out a number (1-4). Students work with a partner to come up with garden vocabulary words that contain that number of syllables. Partner A will begin by naming a vocabulary word with the given number of syllables; partner B will go next. They will alternate until one partner can no longer name a vocabulary word with the given number of syllables.

5. Fruit/Veggie Knock Students will work with a partner and touch knuckle to knuckle (veggie) and palm to palm (fruit) in a given sequence. Teacher will name the sequence to the class (Ex: veggie, veggie, fruit) and students will have to use the given hand gestures to complete the sequence. Teacher will increases the number of movements with each round (Ex: Round 1-veggie, veggie, fruit. Round 2-fruit, veggie, veggie, fruit).

6. Fruit/Veggie Match Students will stand. Teacher will name a fruit or vegetable and students will have to touch that part of the body corresponding to the part of the plant that the fruit or vegetable grows from (roots-feet, stem-legs, leaves-body, flowers-head). Teacher will call out and play the game “Simon says” going a little faster with each round.

7. Plant Part Finger Hop Students touch thumb to thumb, pointer to pointer, middle to middle, ring to ring, pinkie to pinkie as they say the plant part finger hop chant (seeds, roots, stems, leaves, flowers). Teacher will randomly call out a plant part, students will have to touch the corresponding fingers. Teacher will repeat, increasing the pace with each round.

8. The Harvester Students will stand and squat (harvest) with a shovel in hand. They will shovel the dirt over alternating shoulders like a farmer. Students will work at their own pace “harvesting” for the given time frame.

9. Apple Squat Students will stand and begin by squatting. They will then stand up on one foot, hop twice saying “apple, apple” then return to a squat. Repeat with increasing speed each round and alternating feet.

10. Fruit Freeze Teacher will randomly call out different fruits and vegetables. If the teacher calls out a veggie, students have to jog (or march) in place, if teacher calls out a fruit, students have to freeze.

11. Garden Guess Students will work with a partner. Partner A will silently think of a fruit or vegetable. Partner B can ask three questions about what their partner is thinking. After three questions, partner B has to guess the fruit or vegetable. They will then switch roles, and partner B will silently think of a fruit or vegetable and partner A gets to ask questions and guess. Repeat as many times as possible in the given time frame.

OVERVIEW

Students learn how to build a bee box.

OBJECTIVE

- Students will understand the concept of pollination and how it works.
- Students will name pollinators and explain their job in plant reproduction.
- Students will identify parts of a flowering plant.

STANDARD

Nevada State Standards

NV (3)4.3 Identify and compare needs common to most living things.

NV(3)4.6 Distinguish living from non-living according to established criteria (growth, reproduction).

Next Generation Science Standards

3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common, birth, growth, reproduction, and death.

3-LS3-2 Use evidence to support the explanation that the environment can be influenced by the environment (soil type).

3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. influence traits.

3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

TEACHER INFORMATION

A bee box is designed to encourage the health of the bee society. There are a variety of ways to make one. The bee box that will be made in this lesson is designed for the Mason Bees. They are considered ‘solitary bees’ because they do not live in a nest or a hive. These bees will not bore their own holes, instead they will find holes in blocks, walls, wood, or in the ground to lay their eggs. There are some things to consider when placing your bee box outside to provide a home for bees:

- You may attach the box to a building or a tree.
- Make sure the bee box has southern exposure, bees do not want the shaded northern exposure or the very hot western exposure.
- Be careful not to spray any insecticides near or around the bee box.

TIME

Approximately 50 minutes

QUESTIONS

- What is a Bee Box and what are they used for?
- Why do we want to help bees?
- How do bees help our gardens? Our world?

MATERIALS

- Science Journals
- Wooden blocks 2" x 4" (1 per each bee box, depending on how many you would like in your garden)
- Drill
- Non-toxic outdoor paint
- Paintbrushes

PROCEDURE

- For the Teacher: This should be done ahead of time.

1. Bee blocks can be made by drilling nesting holes in the side of wooden 2"x4" blocks 3/32" to 3/8" in diameter, at approximate 3/4" apart. The holes should be smooth inside, and closed at one end. Holes less than 1/4" diameter should be 3-4" deep. For holes 1/4" or larger, a 5-6" depth is best.

- For the Students

1. Show the video *Animal Behavior: Bee Cam* from DiscoveryEducation.com.

2. Discuss the importance of bees in pollination and the world or this YouTube video, *Flight of the Bumble Bee* https://www.youtube.com/watch?v=W2YEzY8tzMU.

3. Give each student a bee box and have them paint the boxes bright colors to attract bees and add color to the garden.

4. When dry, have the students place them in the gardens with entrance holes facing east or southeast, so they get the morning sun.

5. Place them in a location where they will be sheltered from the elements and not in direct sun for any length of time.

6. Each winter, you can bring the boxes in, clean them out, and paint them again for the spring.

ASSESSMENT

Students will write a summary statement about the importance of bees to the gardens and to the world.

ADAPTATIONS

Students will record a narrative about why bees are important to the gardens and the world. *Podcast, short video

Students will research why scientists think bees are in decline in the world. Students will create an eBook to teach people about the decline of bees and how to help with this problem.

Other Bee Box Designs: http://reallygoodwriter.com/bees/mason-bees-in-the-summer/attachment/2012july17masonbeehousetube/Formatted: Font: Italic

DID YOU KNOW?

- People usually imagine busy hives when they think of bees, but there are hundreds of species of solitary bees.

NUTRITION FACTS

- Pollination is essential for cultivating food crops, but not all crops depend on pollinating animals (Ex: Corn is primarily pollinated by wind).

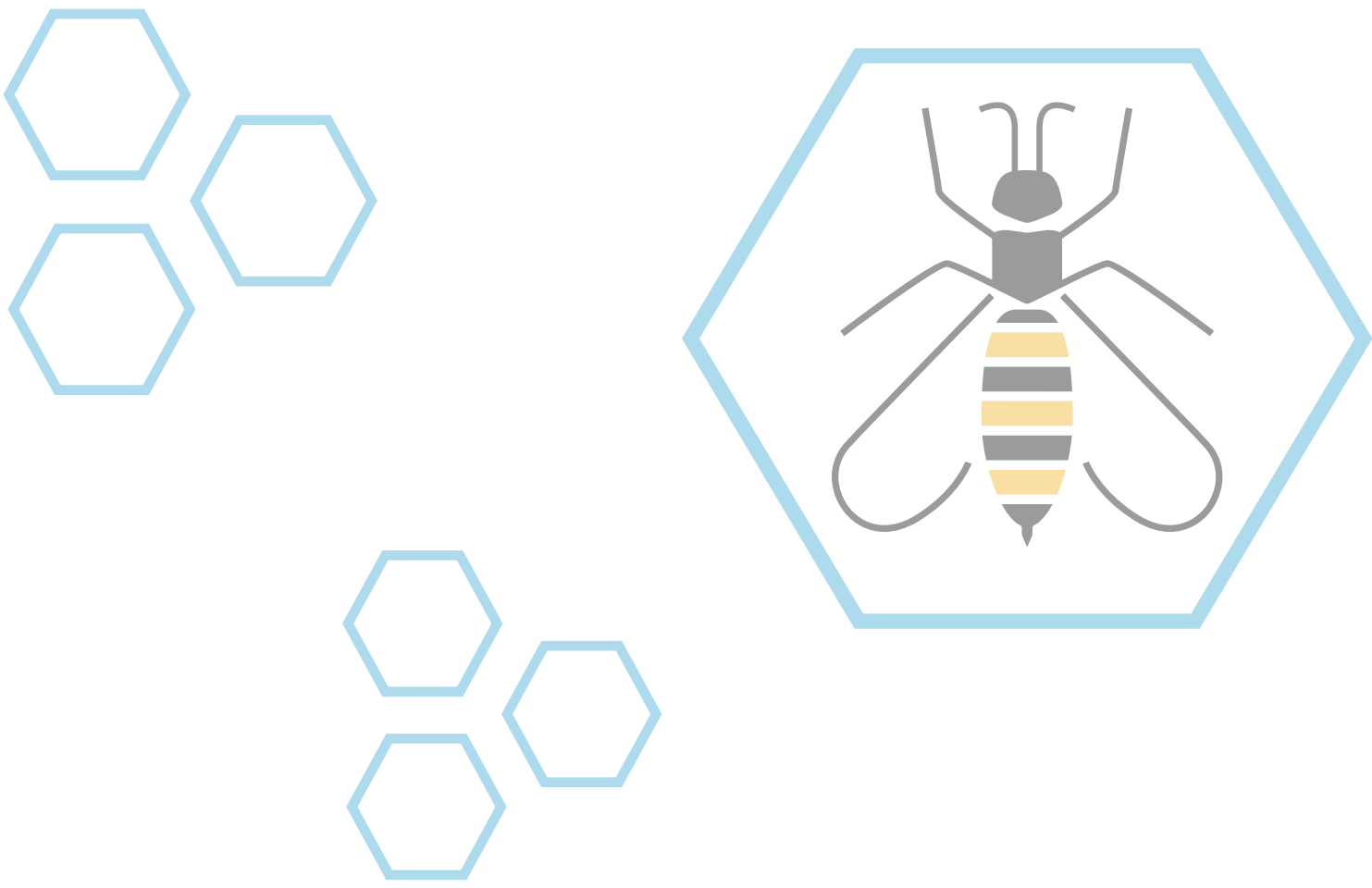
STANDARDS FOR LESSON 16 LESSON MAP

NG:3-LS3-1 Develop models to describe that organisms have unique and diverse life cycles but all have common, birth, growth, reproduction, and death.

3-LS3-2 Use evidence to support the explanation that traits can be influence by the environment.

3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.



LESSON 16 LESSON MAP

Lesson 16: Building Bee Boxes

Day 1

- Watch the video on *Animal Behavior: Bee Cam* on discoveryeducation.com
- Discuss pollination with the class and the importance of bees.

Day 2

- Give each student a bee box and have them paint in bright colors to attract the bees.

Day 3

- Have students place them in the garden to attract bees.

Day 4

- Students research why scientists think bees are in decline around the world.
- Journal their findings.

Garden Observation

- Students will create a narrative of why bees are important to the gardens and the world.

Day(s) 2

Math

Flower Multiplication

Day(s) _____

GLL

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

IMPORTANCE OF BEES IN THE GARDEN

Directions: Write a narrative on why bees are important to our garden and why they are important around the world.

Name:_____

Date: _____

BUILDING BEE BOXES MULTIPLICATION

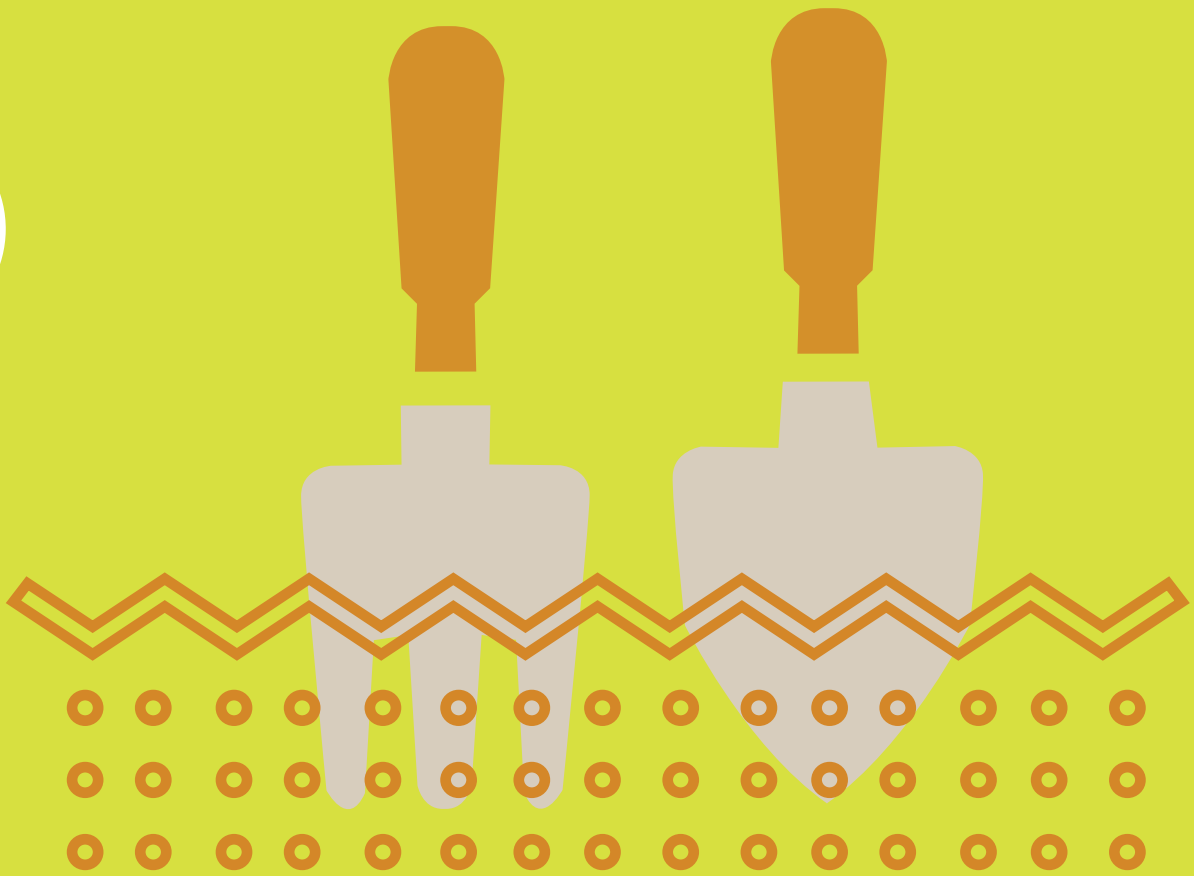
1. Mr. Wilson's class has 3 students who need to make 40 bee boxes each. How many bee boxes does Mr. Wilson's class need to make all together?

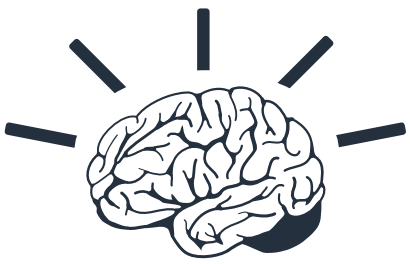
2. There are 50 bees in one bee box. There are 10 bee boxes in the garden. How many bees are there all together?

3. There are 10 schools that are making bee boxes. Each school is responsible for making 80 boxes. How many boxes need to be made by all of the schools?

Lesson Seventeen

Making Mulch





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OVERVIEW

Students will explore mulch and its importance to the garden.

OBJECTIVE

- Students will understand the concept of mulching.
- Students will make mulch to protect the soil/gardens during the summer months.
- Students will find the area, perimeter and volume of the garden beds.

STANDARD

Nevada State Standards

NV (3)4.3 Identify and compare needs common to most living things.

NV(3)4.6 Distinguish living from non-living according to established criteria (growth, reproduction).

Next Generation Science Standards

3-LS3-2 Use evidence to support the explanation that the environment can be influenced by the environment (soil type).

3-LS3 Science and Engineering Practices

Analyzing and Interpreting Data : *Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing qualitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning.*

Constructing Explanations and Design Solutions : *Constructing explanations and design solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence to support an explanation.*

Common Core State Standards - Math

3.MD.C.7b Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole number products as rectangular areas in mathematical reasoning.

3.MD.D.8 Solve real world and mathematical problems involving the perimeter of polygons, including finding the perimeter given the side lengths, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

TEACHER INFORMATION

Many people confuse the terms compost and mulch. Compost is the natural breakdown of plant and animal material by microbial decay into rich humus. Compost is part of the soil. Mulch is a layer of material placed on top of the soil as a protective cover. Mulch can be a variety of things: leaves, bark, straw, rocks, 'living mulch', etc. 'Living Mulch' is also known as a 'Cover Crop'. These are generally low-growing plants planted between the main plants for soil protection and/or soil enrichment.

Mulch helps to keep the weeds down, retain moisture, insulate the soil and reduce erosion. An easy way to remember the difference is: "If it's above ground, it's mulch. If it's below the surface, it's compost."

TIME

Approximately 2 - 50 minute sessions

QUESTIONS

- How will you find find the area, perimeter and volume of the garden bed?
- What is mulch?
- How much mulch do we need to make?
- How will mulch help our garden bed during the summer months?
- What happens to mulch over time?

MATERIALS

- Science Journals
- Garden beds
- Measuring Tapes
- Mulch making materials: chopped leaves, straw, grass clippings, compost, wood chips, shredded bark, sawdust, pine needles, brown paper bags, and shredded paper. Have the students begin collecting the materials well before the lesson.

PROCEDURE

Begin collecting mulch materials before the lesson.

- Day 1

1. Discuss mulch and the importance of protecting the soil/garden bed during the harsh summer months when school is out of session.

2. Students find the definition of mulch and discuss.

3. Pose the problem: How much mulch do we need?

4. Guide students in figuring out that they need to find the perimeter, area, and volume of the garden bed in order to plan for how much mulch is needed.

5. Students work in pairs in the garden to use tape measures and find the perimeter and area of the bed.

6. Students then find the volume of the bed for a mulch depth of 4-6 inches (depending on your resources).

▶ Day 2

1. Students break apart/separate large pieces of mulch material (leaves, straw, paper, etc.).

2. Students mix everything together, moisten and scatter throughout the garden bed.

ASSESSMENT

Students draw a diagram of the garden bed with dimensions labeled.

Students must show their work for finding perimeter, area and volume.

Students demonstrate an understanding of what mulch is and how it helps the garden beds by answering the lesson questions in their science journals. Students explain the benefits of putting mulch in a garden bed.

ADAPTATIONS

Students write the “recipe” for mulch.

Students research the various types of mulch (i.e. rock, straw, living mulch, etc.) to find the advantages and disadvantages of each type of mulch.

Students find the area, perimeter and volume of different objects in the classroom or school yard.

DIGGING DEEPER

- Ask students, why is mulching important? Have them investigate this question by reading three articles about mulch. Gardening magazines and horticultural websites are good sources of information.

DID YOU KNOW?

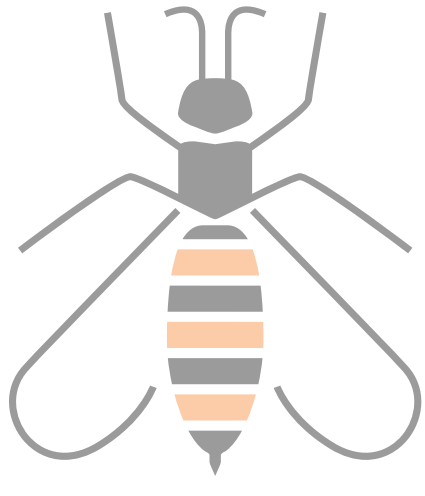
- Some materials should not be used as mulch. The leaves of some plants, like tamarisk and eucalyptus, may slow a garden's growth. Fresh lawn clippings deplete the soil. Styrofoam packing peanuts never break down. Can students think of other materials that should be avoided?

GARDENER'S TIP

- Have students look inside and outside of their homes for possible mulch materials. Do they have any cardboard boxes? Are trees on their street dropping leaves? These items and many others can be used as mulch in the school garden or on plants at home.

NUTRITION FACTS

- Researchers have found that developed regions such as the United States rely on natural pollinators for producing crops of high economic value (such as corn and soybeans).



STANDARDS FOR LESSON 17 LESSON MAP

3-LS3-2 Use evidence to support the explanation that traits can be influence by the environment.

3-LS4-3 Heredity: Inheritance and Variation of Traits.

ELA Reading RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

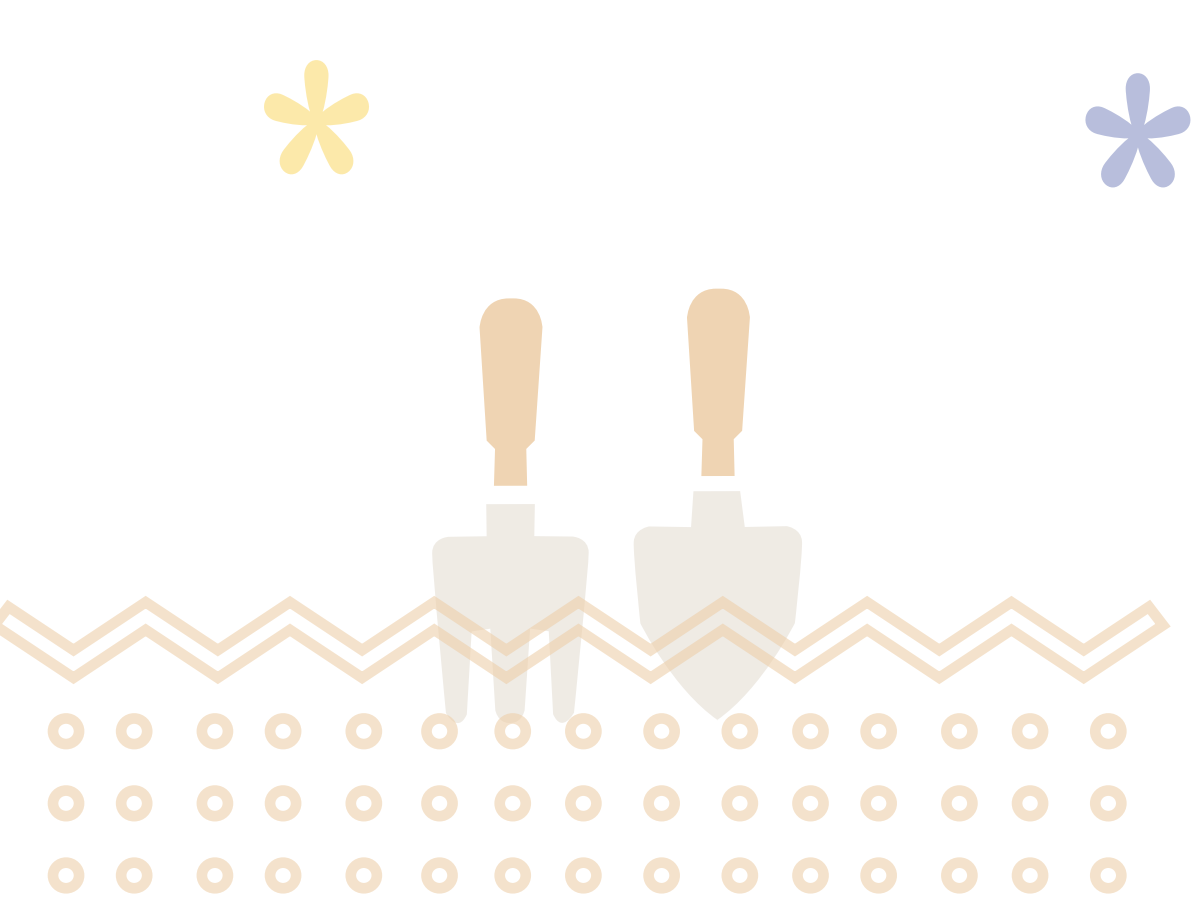
RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Writing W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Math 3.MDC.7B Relate area to the operations of multiplication and addition. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.

3.MDD.8 Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.



LESSON 17 LESSON MAP

Lesson 17: Making Mulch

Day 1

- Discuss mulch and importance of protecting soil/garden bed during summer months.
- Students look up definition of mulch and discuss.
- How much mulch do we need?

Day 2

How much mulch do we need?

- Guide students to figure out the perimeter, area and volume of garden bed to plan.

Day 3

- Students write a recipe for lunch.

Students research different types of mulch to find

- advantages/disadvantages.

Garden Observation

- Students measure garden bed in the garden using their tools and findings from their classroom lesson.

Day(s) 2

Math

Classroom Activity Sheet 2

Day(s) _____

GLL

Literary Elements

Literacy connection:

Book: (Stage) _____

Day(s) _____

Science/Social Studies Extension

Garden Observation

Name:_____

Date: _____

CREATE YOUR OWN MULCH RECIPE

Directions: Create your own recipe for a mulch that would work great in our garden. How much of each ingredient will you need to fill our garden bed? Once complete, draw a picture of the garden bed with your mulch.

Mulch Recipe

Diagram of Garden Bed with Mulch Recipe

Name:_____

Date: _____

OUTDOOR CLASSROOM ACTIVITY SHEET 2

By Vincent D Ortiz

Tommy is really excited about the school garden at Crestwood Elementary, and he wants to make sure that the fruits and vegetables they plant this year survive the extreme cold days of winter. Tommy's teacher has received permission to buy one large tarp to cover the 6 raised garden beds. The teacher will cut the large tarp into smaller tarps.

Directions First, go outside with your teacher and measure the total area of all 6 raised beds. Fill out the chart below to record your findings. Then use that information to figure out what size tarp you need to buy to cover all bed during a freeze.

Bed	Length (ft.)	Width (ft.)	Area (Sq Ft.)
Bed 1			
Bed 2			
Bed 3			
Bed 4			
Bed 5			
Bed 6			
Totals			

Once you have calculated the square feet of all 6 raised beds combined, your next job is to figure out which tarp to buy from the hardware store. Below is a list of sizes that is offered. Make sure that the tarp is big enough to cover all 6 raised beds, but not too big where you are spending too much money on a size you don't need.

Tarp	Size (Sq. Ft.)
Regular Tarp	50 Sq. Ft.
Large Tarp	65 Sq. Ft.
Super Tarp	100 Sq. Ft.
Mega Tarp	200 Sq. Ft.