



Avila Valley Barn Field Trip Guide

Graduate Internship in Agricultural Education

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Introduction

The Avila Valley Barn Field Trip Guide has been created in partnership with Avila Valley Barn. This guide is intended to enhance the existing fieldtrip offerings at Avila Valley Barn. Farm based field trips provide students with a unique opportunity to connect the content they are learning in the classroom to a unique and engaging, real world environment. Farms are rich with opportunities to enforce knowledge across all content areas, at every grade level. Enforcing content standards through fun activities will encourage educators to take part in farm based field trips, and help students make connections between difficult concepts and real world applications.

How to Use the Guide

The guide is broken into sections by grade level; Kindergarten-Second Grade, Third-Fifth Grade, Middle School, and High School. Many of the activities are repeated at each grade level, with the depth of information scaled up or down based on the audience. Background information for the activity facilitator is provided when necessary to ensure that accurate information is shared with the students participating in the activities.

The activities included in this guide are connected to content standards across educational disciplines. The content standards addressed by each activity appear at the top of each activity page. Standards from the following areas have been addressed in the activities: Next Generation Science Standards (**NGSS**), California Health Education Standards (**CA Health**), and California Agriculture and Natural Resources (**CANR**). Many Common Core standards in the area of Speaking & Listening are addressed through these activities as well.

The activities can be used independently to create custom field trips based on grade level, or they can be grouped together based on a theme. The following are some suggestions of complementary groupings:

Ecology Focused

Farm Tour
Composting
Pollinators
Healthy Soils
Energy Transfer Tag

Botany Focused

Farm Tour
Hammered Plant Prints
Collecting Seeds
Plant Parts
Bouquet Creation

Activities may also be grouped by season, and the constraints of the farming operation at the time of the field trip. Successful seasonal grouping may be:

Fall

Seed Collection
Farm to Fork
Apple Cider Pressing
Pumpkin Patch
Corn Maze

Winter

Soil Composition
Farm to Fork
Composting
Seed Parts
Petting Zoo

Spring

Seed Parts
Seed Planting
Pollinators
Hammered Plant Prints
Farm to Fork

Late Spring/Summer/Early Fall

Eating a Rainbow
Collecting Seeds
Bouquet Creation
Energy Transfer Tag
Composting

Some activities that are not included in this guide, but can help to enhance the field trip experience are:

- Apple cider pressing
- Pumpkin patch
- You-pick
- Corn Maze
- Petting zoo
- Scavenger hunts
- Nature walks and observations
- Farming demonstrations
- Making bouquets
- Hammered plant prints
- Pollinator observations
- Seed collection

Preparing for the Field Trip

Rules and expectations-

The first step to any successful field trip is preparation. Once an itinerary has been set, and the activities have been identified, you will need to discuss expectations.

For many students, their first time on a farm will be the moment they step off the bus to begin the field trip. Farms offer a unique and engaging environment, but they offer equally unique hazards. Be sure to communicate with the teacher(s) ahead of time regarding expectations for student behavior, and what the students need to bring.

Students, teachers, and chaperones should be prepared with the following items:

- Close-toed shoes
- Long pants or shorts
- Weather appropriate outerwear
- Lunch (if appropriate)
- Pen or pencil
- Water bottle
- Nametags

Many of the activities in this guide will have greater success with smaller groups of students. Encourage as many chaperones as possible to attend. Review the rules and expectations before each activity. Some activities, such as those that involve cooking or food preparation, will have inherently higher levels of risk. In those cases, make

sure to explain the rules and safety practices, as well as carefully monitor the students throughout the activity.

Materials-

The required materials for each activity are listed on the activity page. The quantity of materials will vary depending on the number of students who will be participating. Always overestimate the amount of materials needed. There should be enough for each student, and extra in case a student makes an error.

K-2

Activities for students
Kindergarten - Second Grade

Composting

Description

Students will investigate samples from various locations in the compost pile, looking for similarities and differences in the insects present at each location. Additionally, students will learn about the benefits that plants receive from compost, and the importance of decomposers in ecosystems.

Standards

K-LS1- 1. Use observations to describe patterns of what plants and animals (including humans) need to survive. **(NGSS)**

K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. **(NGSS)**

2-LS4- 1. Make observations of plants and animals to compare the diversity of life in different habitats. **(NGSS)**

Materials:

Light-colored trays or pans, or white paper
Plastic tweezers
Plastic spoons
Jars for temporary sorting and display of organisms
Magnifying glasses or hand lenses
Petri dish for use with magnifying lenses
Fresh compost samples, from multiple locations within the pile

Time

30 minutes

Procedure

1. Take samples of compost from various locations in the pile. Spread each compost sample in a large tray or pan, or on a large piece of paper, preferably light in color for maximum contrast. Have multiple stations set up for each sample. As the students make observations, ask questions such as: Are there some organisms that you find near the surface and others only at greater

depths? What role do you think these insects play in the composting process?
*When sorting through the compost, students should use soft tweezers, plastic spoons, or other instruments that will not hurt the organisms.

2. Flashlights and magnifying glasses or hand lenses can be used to enhance the observation. The larger organisms, such as worms, centipedes, millipedes, beetles, and other large insects can easily be seen with the naked eye, but they can be observed more closely under the magnifying glass or hand lens. Place samples of the compost in jars and observe them under a magnifying glass or hand lens.

3. Throughout the observation process, discuss the importance of compost for plants, the functions of macro- and micro- organisms on the compost breakdown process, and the environmental benefits of composting food waste.

4. At the end of the activity, return the samples and insects to the compost pile.

Variations

In combination with a Farm to Fork, Eating a Rainbow, you-pick, or other activity that involves the production of food waste, lead students through the process on starting a well balanced compost pile. (30 minutes)

Eating a Rainbow

Description

Students will participate in a scavenger hunt on the farm to find and eat fruits and vegetables of every color of the rainbow.

Standards

K 1.1.N Name a variety of healthy foods and explain why they are necessary for good health. **(CA Health)**

2 1.7.N Identify a variety of healthy snacks. **(CA Health)**

2 1.9.N Explain how both physical activity and eating habits can affect a person's health. **(CA Health)**

Materials:

Worksheet (attached) – 1 per student

Baskets

Harvest tools

Washing station

Time

30 minutes- Scavenger hunt

30 minutes- Snack

Procedure

1. Discussion- Ask the students the following questions: What are the colors of the rainbow? What fruits and vegetables are each of those colors? Discuss how different colors in fruits and vegetables represent the presence of different vitamins and nutrients. These nutrients work together to keep our bodies healthy. This is why it is important to eat a rainbow of fruits and vegetables!

2. Students break into pairs or small groups. Each group receives a worksheet with examples of fruits and vegetables in each color category. Review the information on the worksheet with the students.

3. Lead students to the scavenger hunt area, and remind them of the rule to

follow around the crops. Distribute baskets that they can use to collect their harvested items.

4. Explain that they are to explore the area, and identify crops that are colors of the rainbow. When the students find a crop that matches one of the colors, they will call the activity leader or parent volunteer to their location, who will verify that the students have identified the appropriate part of the plant and assist with harvest.

5. Recall the students from the scavenger hunt area, and proceed to the washing station, where students will wash their harvested fruits and vegetables.

6. If necessary, cut the fruits and vegetables, or allow the students to do so. Give students the opportunity to sample each of the fruits and vegetables that they harvested.

Variations:

Break students into teams for each color of the rainbow (i.e. Red team, Orange team, Green team, Purple team, White team.) Each team will search for and harvest as many fruits and vegetables of that color as possible. At the end of the scavenger hunt, the groups will come back together and share their fruits and vegetables with the class.



RED

TOMATO PEPPER RASBERRY STRAWBERRY CHERRY



ORANGE

ORANGE PUMPKIN SWEET POTATO CARROT SQUASH



WHITE

CAULIFLOWER ONION GARLIC POTATO WHITE CORN



GREEN

SPINACH AVOCADO KIWIFRUIT LETTUCE CUCUMBER



PURPLE

RED GRAPE FIG BLACKBERRY EGGPLANT BLUEBERRY

Eating a Rainbow- Activity Background

Red fruits and vegetables may help reduce risk of several types of cancer. Antioxidants in these fruits and vegetables are linked with keeping our hearts healthy. Examples:

- Red peppers
- Beets
- Pomegranates
- Cherries
- Cranberries
- Raspberries
- Strawberries
- Tomatoes
- Watermelon

Orange/yellow fruits and vegetables help to maintain healthy eyes, help reduce risk of cancer, heart disease and can improve immune system function. Citrus fruits like oranges are a good source of vitamin C. Examples:

- Peaches
- Apricots
- Squash
- Cantaloupe
- Persimmons
- Carrots
- Pineapple
- Lemons
- Mangoes
- Oranges
- Sweet potatoes

Green fruits and vegetables help keep eyes healthy and may help protect against some types of cancer. Examples:

- Artichokes
- Kiwi
- Asparagus
- Lettuce
- Avocados
- Green beans
- Broccoli
- Brussels sprouts

Green pepper
Green cabbage
Spinach
Cucumbers
Zucchini

Blue/purple fruits and vegetables have antioxidants that protect cells from damage. They may help reduce risk of cancer, stroke and heart disease. Examples:

Blackberries
Purple grapes
Blueberries
Eggplant
Figs
Plums
Red/purple cabbage

White fruits and vegetables may help lower cholesterol and blood pressure and may help reduce risk of stomach cancer and heart disease. Some members of the white group, such as bananas and potatoes, are good sources of potassium. Examples:

Bananas
Onions
Cauliflower
Parsnips
Garlic
Potatoes
Turnips
Mushrooms

Farm to Fork

Description

Students will have the opportunity to make a snack made primarily from components grown on site.

Standards

K 7.1.N Select nutritious snacks. **(CA Health)**

2 1.7.N Identify a variety of healthy snacks. **(CA Health)**

2 1.9.N Explain how both physical activity and eating habits can affect a person's health. **(CA Health)**

Materials:

Subject to change based on age, recipe, and season; generally:

Seasonally appropriate farm-produced ingredients, based on recipe
Cooking utensils needed for the recipe (knives, cutting boards, bowls, etc.)
Eating utensils (plates, bowls, forks, etc.)
Napkins
Hand washing station
Buckets for food scrapes
Cooking stations

Time

30-90 minutes, depending on recipe chosen, and possible variations.

Procedure

*Cooking activities require greater supervision and individual feedback. As such, groups should be kept to a maximum of 10 students per leader. Choose the recipe with the teacher prior to the field trip to ensure that you select a recipe that is an appropriate level for the group. Choose recipes with minimal cooking or cutting for younger students, and more complex recipes for older or experienced students. Ask the teacher to check with the students or parents regarding food allergies, and ensure that you choose an inclusive recipe.

Require students to wash their hands before beginning.

1. Start by introducing the recipe to the students. Discuss each farm grown component, including the growing season, what part of the plant it is, and other uses for it.
2. Next, show the students the utensils and equipment that will be used, and review any safety concerns or techniques for their proper use.
3. Demonstrate the recipe step by step, allowing the students to complete each step before continuing to demonstrate the following step. Circulate between the students, helping with their use of the utensils and equipment and answering questions. Ensure that students are completing the recipe safely.
4. As students complete their recipes, check that all heat sources have been shut off, and all sharp cooking utensils are collected and accounted for.
5. Provide students with plates, bowls, or flatware as needed. Allow students time to eat, and if time permits, discuss successes and challenges they faced in the cooking process.
6. After they have eaten their food, students will clean the station at which they worked.

Variations:

Lead students around the farm to harvest the required ingredients. Provide a washing station for the ingredients.

Pair with a compost activity. Students will “feed” the compost with the food scrapes, and then learn about composting methods.

Parts of a Seed

Description

Students will explore the parts of seeds and their function using the metaphor of a hiker. Once they have learned the basic parts of seeds, they will dissect a seed to see the actual components.

Standards

C11.1 Understand the anatomy and functions of plant systems and structures. **(CANR)**

F2.2 Diagram the seed's essential parts and explain the functions of each. **(CANR)**

G3.2 Label the seed's essential parts and describe their functions. **(CANR)**

Time

1 Hour

Materials

Lima beans, soaked in water overnight, three per student

Backpack

Rain jacket or poncho

Snack placed inside of a lunchbox (to be placed inside backpack)

Water bottle with straw (to be placed inside backpack)

Hat (to be placed inside backpack)

Hand lens, one per student

Tape and labels for seed parts (Seed Coat, Cotyledon, Embryo, New Leaves, and Roots)

Advanced Preparation: Soak lima beans in water overnight.

Procedure

1. Tell the students to pretend that they are about to go on a hike. Ask the student how you protect yourself from the wind, rain and cold. (Answer: a coat.) Ask for a student volunteer to wear the coat. Explain that a seed also has a coat and when conditions are right for growth, the seed will absorb water and split the seed coat. This is called germination. Put the label "Seed Coat" on the coat and have the student remove the coat and place it on a table with the label showing.
2. Ask the students what a hiker would need on a long hike. (Answer: Lunch or a snack.) Have the student open the backpack and find a lunch box with the snack. Explain that seeds also store food and they store it in a cotyledon, which provides the initial energy for the plant to germinate and grow. Attach the "Cotyledon" label to the lunchbox, and place the lunchbox on a table with the label showing.
3. What else does a hiker need? (Answer: Water.) Have a student remove the water bottle from the backpack. How do plants get water? (Answer: Roots.) Attach "Roots" to the straw of the water bottle, and place the water bottle on a table with the label showing.
4. What else might the hiker need on a hot day? (Answer: A hat.) Attach the "New Leaves" label to the hat. Have a student remove the hat from the backpack and compare the hat to the first green leaves a seedling puts out to absorb sunlight. Talk about photosynthesis. Place the hat on a table with the label showing.
5. Explain that the leaves and roots grew from the embryo inside the seed. Put the sign "Embryo" on the student. Review the various parts of the seeds using the props.
6. Have the students break into pairs. Explain that they will dissect a seed. Hand out four seeds and two hand lenses to each pair. Demonstrate how to take the seed apart.
7. As they are dissecting the seed, ask the following questions: Have them rub the seed between their fingers to see if they can remove the outer covering. What is this and what is its function? (Answer: seed coat and it protects the seed within it.) Inside the seed coat are large fleshy structures. What are these and their function? (Answer: Cotyledons used for stored food to help

the plant grow until it produces true leaves. Cotyledons die back as the true leaves emerge to carry out photosynthesis. Question: What happens if you plant a seed too deep? Have the students break open the seed, carefully splitting it lengthwise. What do they see in the inner curve of the cotyledons? (Answer: A tiny plant or embryo, made up of the first true leaves and the root.) Have them use the hand lens and draw the seed and label the parts.

*Adapted from OAEC

Senses on the Farm

Description

Students will work in groups using their senses to classify contrasting objects they find on the farm.

Standards

2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. **(NGSS)**

1.6.G Name and describe the five senses. **(CA Health)**

Materials

Egg cartons (one per group) with the following sense-based words written on the inside:

Wet/Dry
Smooth/Rough
Light/Dark
Smell/No Smell
Bright/Dull
Soft/Hard

Time

1 Hour

Procedure

1. Use a discussion to begin the activity. Ask students: What are your senses (sight, sound, taste, touch, smell)? How would you use them on the farm? What are opposites? What are some examples that you can find on the farm?
2. Break the students into small groups. Explain that the groups will be getting a container in which they will be able to collect the opposites that they find. They should use all of their senses (just not taste!) to find examples of each of the opposites that are written on the bottom of the carton.
3. Hand out the cartons, and show the groups how to arrange the opposites that they find.

4. Tell the students that they should only collect small amounts of each object.

5. Allow the students 30-40 minutes to explore the area and find their objects.

6. Call the student groups back together. Let the different groups explore the objects that they found for each set of opposites.

*Adapted from LifeLab

Baby Farm Animals

Description

Children learn the names of farm animals, their babies, their role on the farm, and the noise that those particular animals make.

Standards

1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. **(NGSS)**

1-LS3-1. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. **(NGSS)**

Materials

1 set of large laminated cards with a picture of each of the following farm animal and its name on the front:

Cow
Horse
Chicken
Sheep
Duck
Pig

The reverse side of the card has a picture of that animal as a baby and the name of the baby.

1 or more sets of flashcards as needed for the size of the group. Each set contains 6 pairs of cards; one card showing the adult, the other card showing the baby.

Time

30 Minutes

Procedure

1. Explain the next activity is a game called Farm Animal Babies. Present the large index cards to the students. Explain the front of the card is the name and picture of an animal raised on the farm. The back is the name and picture of that animals' baby.
2. Show the students the adult side of a card. Ask if anyone knows what the animal is called, offering the name if the students do not know, and having the students repeat the name together. Repeat with the baby side of the card. Continue this with each card. After running through the names, lead the group to make the sound together.
3. Run through the cards a second time. Say the names of adults and babies, and make the noises together.
4. Explain that they are going to play a game using the names they just learned. Give the directions to the game:

Each child will receive one card with an animal on it. After they get their card, they are to look at the animal they will pretend to be. They will then spread out and find their mother or baby. (If they are a sheep, they must find a lamb and vise versa.) In order to find their partner they must walk around making the noise of the animal they are representing. For babies they get down really low and walk around, while adults stand as tall as they can. This allows them to distinguish between adults and babies. After they find each one and other, they must put their hands together high in the air and make their noise together.

5. If there are more than 12 students, break into 2 groups, or distribute cards with duplicated animals.
6. Instruct students to stand in a line in order to receive their cards.
7. Hand out cards to each student. After everyone knows what animal they are, allow the game to begin. Ensure that each student understands what animal they are, what noise they make, and if they are a baby or an adult.
8. Let the students play the game for a few minutes. Assist students having

trouble finding their partner.

9. If time allows, collect the cards from the students, and redistribute to begin the game again.

10. Collect the cards from the students when the activity is finished.

Variations

Place the small flashcards randomly around the area. When you are ready to begin the game, instruct the students that they must search the area for a card, like an Easter egg hunt! Once each student has a flash card, begin at step 4.

Farm Tour

Description

Students will participate in a farm tour, interact with and observe plants and animals on the farm, learn the concept of 'basic needs' in relation to plants and animals, and investigate and compare the needs of farm animals and field crops.

Standards

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. **(NGSS)**

K-ESS3-1. Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. **(NGSS)**

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. **(NGSS)**

Time

1 Hour

Procedure

1. Gather the group together before beginning the farm tour to begin the discussion on 'basic needs'. Ask students what they believe a basic need of a living thing is. Relate this to plants and animals found on the farm, touching on the basics such as air, water, food, and shelter.
2. Walk the group around the farm, stopping to observe farm animals while continuing the conversation on basic needs. Allow time to interact with the farm animals.
3. Stop the tour at near field crops to allow students to observe and inspect the plants. While looking at each crop instruct children to think about what the plants need to survive. After spending time observing the plants, begin a discussion relating to space, light, water, soil, and air needs for both crops.
4. Discuss the similarities and differences between the needs of plants and animals.

3-5

Activities for students
Third - Fifth Grade

Composting

Description

Students will investigate samples from various locations in the compost pile, looking for similarities and differences in the insects present at each location. Additionally, students will learn about the benefits that plants receive from compost, and the importance of decomposers in ecosystems.

Standards

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. (NGSS)

5-LS2- 1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (NGSS)

Materials:

Light-colored trays or pans
Plastic tweezers
Plastic spoons
Jars for temporary sorting and display of organisms
Magnifying glasses or hand lenses
Petri dish for use with magnifying lenses
Fresh compost samples, from multiple locations within the pile

Time

30 minutes- Scavenger hunt

Procedure

1. Take samples of compost from various locations in the heap. Spread each compost sample in a large tray or pan, or on a large piece of paper, preferably light in color for maximum contrast. Have multiple stations set up for each sample. As the students make observations, ask questions such as: Are there some organisms that you find near the surface and others only at greater depths? What role do you think these insects play in the composting process?

*When sorting through the compost, students should use soft tweezers, plastic spoons, or other instruments that will not hurt the organisms.

2. Flashlights and magnifying glasses or hand lenses can be used to enhance the observation. The larger organisms, such as worms, centipedes, millipedes, beetles, and other large insects can easily be seen with the naked eye, but they can be observed more closely under the magnifying glass or hand lens. Place samples of the compost in jars and observe them under a magnifying glass or hand lens.

3. Throughout the observation process, discuss the importance of compost for plants, the functions of macro- and micro- organisms on the compost breakdown process, and the environmental benefits of composting food waste.

Variations

In combination with a Farm to Fork, Eating a Rainbow, you-pick, or other activity that involves the production of food waste, lead students through the process on starting a well balanced compost pile, with an emphasis on carbon and nitrogen containing waste, proper moisture, and aeration. (30 minutes)

Eating a Rainbow

Description

Students will participate in a scavenger hunt on the farm to find and eat fruits and vegetables of every color of the rainbow. Additionally, students will understand the nutritional characteristics of fruits and vegetables based on their color.

Standards

4 1.1.N Identify and define key nutrients and their functions.

Materials:

Worksheet (attached)
Baskets
Harvest tools
Washing station
Cutting boards
Knives

Time

30 minutes- Scavenger hunt
30 minutes- Snack

Procedure

1. Discussion- Ask the students the following questions: What are the colors of the rainbow? What fruits and vegetables are each of those colors? Discuss how different colors in fruits and vegetables represent the presence of different vitamins and nutrients. These nutrients work together to keep our bodies healthy. This is why it is important to eat a rainbow of fruits and vegetables!
2. Students break into pairs or small groups. Each group receives a worksheet with examples of fruits and vegetables in each color category. Review the information on the worksheet with the students.
3. Lead students to the scavenger hunt area, and remind them of the rule to follow around the crops. Distribute baskets that they can use to collect their harvested items.

4. Explain that they are to explore the area, and identify crops that are colors of the rainbow. When the students find a crop that matches one of the colors, they will call the activity leader or parent volunteer to their location, who will verify that the students have identified the appropriate part of the plant and assist with harvest.
5. Allow students to move freely through the scavenger hunt, assisting as needed with identification of crops and with appropriate harvest methods.
6. Recall the students from the scavenger hunt area, and proceed to the washing station, where students will wash their harvested fruits and vegetables.
7. If necessary, cut the fruits and vegetables, or allow the students to do so. Give students the opportunity to sample each of the fruits and vegetables that they harvested.

Variations:

Break students into teams for each color of the rainbow (i.e. Red team, Orange team, Green team, Purple team, White team.) Each team will search for and harvest as many fruits and vegetables of that color as possible. At the end of the scavenger hunt, the groups will come back together and share their fruits and vegetables with the class.



RED

TOMATO PEPPER RASBERRY STRAWBERRY CHERRY



ORANGE

ORANGE PUMPKIN SWEET POTATO CARROT SQUASH



WHITE

CAULIFLOWER ONION GARLIC POTATO WHITE CORN



GREEN

SPINACH AVOCADO KIWIFRUIT LETTUCE CUCUMBER



PURPLE

RED GRAPE FIG BLACKBERRY EGGPLANT BLUEBERRY

Eating a Rainbow- Activity Background

Red fruits and vegetables may help reduce risk of several types of cancer. Antioxidants in these fruits and vegetables are linked with keeping our hearts healthy. Examples:

- Red peppers
- Beets
- Pomegranates
- Cherries
- Cranberries
- Raspberries
- Strawberries
- Tomatoes
- Watermelon

Orange/yellow fruits and vegetables help to maintain healthy eyes, help reduce risk of cancer, heart disease and can improve immune system function. Citrus fruits like oranges are a good source of vitamin C. Examples:

- Peaches
- Apricots
- Squash
- Cantaloupe
- Persimmons
- Carrots
- Pineapple
- Lemons
- Mangoes
- Oranges
- Sweet potatoes

Green fruits and vegetables help keep eyes healthy and may help protect against some types of cancer. Examples:

- Artichokes
- Kiwi
- Asparagus
- Lettuce
- Avocados
- Green beans
- Broccoli
- Brussels sprouts

Green pepper
Green cabbage
Spinach
Cucumbers
Zucchini

Blue/purple fruits and vegetables have antioxidants that protect cells from damage. They may help reduce risk of cancer, stroke and heart disease. Examples:

Blackberries
Purple grapes
Blueberries
Eggplant
Figs
Plums
Red/purple cabbage

White fruits and vegetables may help lower cholesterol and blood pressure and may help reduce risk of stomach cancer and heart disease. Some members of the white group, such as bananas and potatoes, are good sources of potassium. Examples:

Bananas
Onions
Cauliflower
Parsnips
Garlic
Potatoes
Turnips
Mushrooms

Farm to Fork

Description

Students will have the opportunity to make a snack made primarily from components grown on site.

Objectives

Students will appreciate the importance of fruits and vegetables in a healthy lifestyle. **(CA Health)**

Students will learn how to prepare healthy snack and meals with fresh ingredients. **(CA Health)**

Students will practice safe food handling skills. **(CA Health)**

Standards

4. 1.4.N Identify how to keep food safe through proper food preparation and storage.

5 1.5.N Describe safe food handling and preparation practices.

Materials:

Subject to change based on age, recipe, and season; generally:

Seasonally appropriate farm-produced ingredients, based on recipe
Cooking utensils needed for the recipe (knives, cutting boards, bowls, etc.)

Eating utensils (plates, bowls, forks, etc.)

Napkins

Hand washing station

Buckets for food scrapes

Cooking stations

Time

30-90 minutes, depending on recipe chosen, and possible variations.

Procedure

*Cooking activities require greater supervision and individual feedback. As

such, groups should be kept to a maximum of 10 students per leader. Choose the recipe with the teacher prior to the field trip to ensure that you select a recipe that is an appropriate level for the group. Choose recipes with minimal cooking or cutting for younger students, and more complex recipes for older or experienced students. Ask the teacher to check with the students or parents regarding food allergies, and ensure that you choose an inclusive recipe.

Require students to wash their hands before beginning.

1. Start by introducing the recipe to the students. Discuss each farm grown component, including the growing season, what part of the plant it is, and other uses for it.
2. Next, show the students the utensils and equipment that will be used, and review any safety concerns or techniques for their proper use.
3. Demonstrate the recipe step by step, allowing the students to complete each step before continuing to demonstrate the following step. Circulate between the students, helping with their use of the utensils and equipment and answering questions. Ensure that students are completing the recipe safely.
4. As students complete their recipes, check that all heat sources have been shut off, and all sharp cooking utensils are collected and accounted for.
5. Provide students with plates, bowls, or flatware as needed. Allow students time to eat, and if time permits, discuss successes and challenges they faced in the cooking process.
6. After they have eaten their food, students will clean the station at which they worked.

Variations:

Lead students around the farm to harvest the required ingredients. Provide a washing station for the ingredients.

Pair with a compost activity. Students will “feed” the compost with the food scraps, and then learn about composting methods.

Parts of a Seed

Description

Students will explore the parts of seeds and their function using the example of a hiker as a stand-in. Once they have learned the basic parts of seeds, they will dissect a seed to see the actual components.

Standards

C11.1 Understand the anatomy and functions of plant systems and structures. **(CANR)**

F2.2 Diagram the seed's essential parts and explain the functions of each. **(CANR)**

G3.2 Label the seed's essential parts and describe their functions. **(CANR)**

Time

1 Hour

Materials

Lima beans, soaked in water overnight, three per student

Backpack

Rain jacket or poncho

Snack placed inside of a lunchbox (to be placed inside backpack)

Water bottle with straw (to be placed inside backpack)

Hat (to be placed inside backpack)

Hand lens, one per student

Tape and labels for seed parts (Seed Coat, Cotyledon, Embryo, New Leaves, and Roots)

Advanced Preparation: Soak lima beans in water overnight.

Procedure

1. Tell the students to pretend that they are about to go on a hike. Ask the student how you protect yourself from the wind, rain and cold. (Answer: a coat.) Ask for a student volunteer to wear the coat. Explain that a seed also has a coat and when conditions are right for growth, the seed will absorb water and split the seed coat. This is called germination. Put the label “Seed Coat” on the coat and have the student remove the coat and place it on a table with the label showing.

2. Ask the students what a hiker would need on a long hike. (Answer: Lunch or a snack.) Have the student open the backpack and find a lunch box with the snack. Explain that seeds also store food and they store it in a cotyledon, which provides the initial energy for the plant to germinate and grow. Attach the “Cotyledon” label to the lunchbox, and place the lunchbox on a table with the label showing.

3. What else does a hiker need? (Answer: Water.) Have a student remove the water bottle from the backpack. How do plants get water? (Answer: Roots.) Attach “Roots” to the straw of the water bottle, and place the water bottle on a table with the label showing.

4. What else might the hiker need on a hot day? (Answer: A hat.) Attach the “New Leaves” label to the hat. Have a student remove the hat from the backpack and compare the hat to the first green leaves a seedling puts out to absorb sunlight. Talk about photosynthesis. Place the hat on a table with the label showing.

5. Explain that the leaves and roots grew from the embryo inside the seed. Put the sign “Embryo” on the student. Review the various parts of the seeds using the props.

6. Have the students break into pairs. Explain that they will dissect a seed. Hand out four seeds and two hand lenses to each pair. Demonstrate how to take the seed apart.

7. As they are dissecting the seed, ask the following questions: Have them rub the seed between their fingers to see if they can remove the outer covering. What is this and what is its function? (Answer: seed coat and it protects the seed within it.) Inside the seed coat are large fleshy structures. What are these and their function? (Answer: Cotyledons used for stored food to help the plant grow until it produces true leaves. Cotyledons die back as the true leaves emerge to carry out photosynthesis. Question: What happens if you

plant a seed too deep? Have the students break open the seed, carefully splitting it lengthwise. What do they see in the inner curve of the cotyledons? (Answer: A tiny plant or embryo, made up of the first true leaves and the root.) Have them use the hand lens and draw the seed and label the parts.

*Adapted from OAEC

Middle School

Activities for students
in Middle School

Composting

Description

Students will investigate samples from various locations in the compost pile, looking for similarities and differences in the insects present at each location. Additionally, students will learn about the benefits that plants receive from compost, and the importance of decomposers in ecosystems.

Standards

MS-LS2- 1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. **(NGSS)**

MS-LS2- 3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem services. **(NGSS)**

MS-ESS3- 3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. **(NGSS)**

Materials:

Light-colored trays or pans
Plastic tweezers
Plastic spoons
Jars for temporary sorting and display of organisms
Magnifying glasses or hand lenses
Petri dish for use with magnifying lenses
Fresh compost samples, from multiple locations within the pile

Time

30 minutes

Procedure

1. Take samples of compost from various locations in the heap. Spread each compost sample in a large tray or pan, or on a large piece of paper, preferably light in color for maximum contrast. Have multiple stations set up for each sample. As the students make observations, ask questions such as: Are there some organisms that you find near the surface and others only at greater depths? What role do you think these insects play in the composting process?

*When sorting through the compost, students should use soft tweezers, plastic spoons, or other instruments that will not hurt the organisms.

2. Flashlights and magnifying glasses or hand lenses can be used to enhance the observation. The larger organisms, such as worms, centipedes, millipedes, beetles, and other large insects can easily be seen with the naked eye, but they can be observed more closely under the magnifying glass or hand lens. Place samples of the compost in jars and observe them under a magnifying glass or hand lens.

3. Throughout the observation process, discuss the importance of compost for plants, the functions of macro- and micro- organisms on the compost breakdown process, and the environmental benefits of composting food waste.

Variations

In combination with a Farm to Fork, Eating a Rainbow, you-pick, or other activity that involves the production of food waste, lead students through the process on starting a well balanced compost pile, with an emphasis on carbon and nitrogen containing waste, proper moisture, and aeration. (30 minutes)

Eating a Rainbow

Description

Students will participate in a scavenger hunt on the farm to find and eat fruits and vegetables of every color of the rainbow. Additionally, students will understand the nutritional characteristics of fruits and vegetables based on their color.

Standards

7/8 1.1.N Describe the short- and long-term impact of nutritional choices on health. **(CA Health)**

Materials:

Worksheet (attached)
Baskets
Harvest tools
Washing station
Cutting boards
Knives

Time

30 minutes- Scavenger hunt
30 minutes- Snack

Procedure

1. Discussion- Ask the students the following questions: What are the colors of the rainbow? What fruits and vegetables are each of those colors? Discuss how different colors in fruits and vegetables represent the presence of different vitamins and nutrients. These nutrients work together to keep our bodies healthy. This is why it is important to eat a rainbow of fruits and vegetables!
2. Students break into pairs or small groups. Each group receives a worksheet with examples of fruits and vegetables in each color category. Review the information on the worksheet with the students.

3. Lead students to the scavenger hunt area, and remind them of the rule to follow around the crops. Distribute baskets that they can use to collect their harvested items.

4. Explain that they are to explore the area, and identify crops that are colors of the rainbow. When the students find a crop that matches one of the colors, they will call the activity leader or parent volunteer to their location, who will verify that the students have identified the appropriate part of the plant and assist with harvest.

5. Allow students to move freely through the scavenger hunt, assisting as needed with identification of crops and with appropriate harvest methods.

6. Recall the students from the scavenger hunt area, and proceed to the washing station, where students will wash their harvested fruits and vegetables.

7. If necessary, cut the fruits and vegetables, or allow the students to do so. Give students the opportunity to sample each of the fruits and vegetables that they harvested.

Variations:

Break students into teams for each color of the rainbow (i.e. Red team, Orange team, Green team, Purple team, White team.) Each team will search for and harvest as many fruits and vegetables of that color as possible. At the end of the scavenger hunt, the groups will come back together and share their fruits and vegetables with the class.



RED

TOMATO PEPPER RASBERRY STRAWBERRY CHERRY



ORANGE

ORANGE PUMPKIN SWEET POTATO CARROT SQUASH



WHITE

CAULIFLOWER ONION GARLIC POTATO WHITE CORN



GREEN

SPINACH AVOCADO KIWIFRUIT LETTUCE CUCUMBER



PURPLE

RED GRAPE FIG BLACKBERRY EGGPLANT BLUEBERRY

Eating a Rainbow- Activity Background

Red fruits and vegetables are colored by natural plant pigments called “lycopene” or “anthocyanins.” Lycopene may help reduce risk of several types of cancer. Anthocyanins act as powerful antioxidants that protect cells from damage. Antioxidants are linked with keeping our hearts healthy. Examples:

- Red peppers
- Beets
- Pomegranates
- Cherries
- Cranberries
- Raspberries
- Strawberries
- Tomatoes
- Watermelon

Orange/yellow fruits and vegetables are usually colored by natural plant pigments called “carotenoids.” Beta-carotene is converted to vitamin A, which helps maintain healthy eyes. Carotenoid-rich foods can help reduce risk of cancer, heart disease and can improve immune system function. Citrus fruits like oranges are not a good source of vitamin A, but they are an excellent source of vitamin C. Examples:

- Peaches
- Apricots
- Squash
- Cantaloupe
- Persimmons
- Carrots
- Pineapple
- Lemons
- Mangoes
- Oranges
- Sweet potatoes

Green fruits and vegetables are colored by natural plant pigment called “chlorophyll.” Some members of the green group, including spinach and other dark leafy greens, green peppers, peas, cucumber and celery, contain lutein. Lutein works to help keep eyes healthy. The “indoles”, organic compounds, in broccoli, cauliflower, cabbage and other cruciferous vegetables may help protect against some types of cancer. Leafy greens such as spinach and broccoli are excellent sources of folate, a B vitamin that helps reduce risk of birth defects. Some examples of the green group include:

Artichokes
Kiwi
Asparagus
Lettuce
Avocados
Green beans
Broccoli
Brussels sprouts
Green pepper
Green cabbage
Spinach
Cucumbers
Zucchini

Blue/purple fruits and vegetables are colored by natural plant pigments called “anthocyanins.” Anthocyanins act as antioxidants that protect cells from damage. They may help reduce risk of cancer, stroke and heart disease. Examples:

Blackberries
Purple grapes
Blueberries
Eggplant
Figs
Plums
Red/purple cabbage

White fruits and vegetables are colored by pigments called “anthoxanthins.” They may contain health-promoting chemicals such as allicin, which may help lower cholesterol and blood pressure and may help reduce risk of stomach cancer and heart disease. Some members of the white group, such as bananas and potatoes, are good sources of potassium. Examples:

Bananas
Onions
Cauliflower
Parsnips
Garlic
Potatoes
Turnips
Mushrooms

Farm to Fork

Description

Students will have the opportunity to make a snack made primarily from components grown on site.

Objectives

Students will appreciate the importance of fruits and vegetables in a healthy lifestyle.

Students will learn how to prepare healthy snack and meals with fresh ingredients.

Students will practice safe food handling skills.

Standards

7/8 1.4.N Describe how to keep food safe through proper food purchasing, preparation, and storage practices.

Materials:

Subject to change based on age, recipe, and season; generally:

Seasonally appropriate farm-produced ingredients, based on recipe
Cooking utensils needed for the recipe (knives, cutting boards, bowls, etc.)
Eating utensils (plates, bowls, forks, etc.)
Napkins
Hand washing station
Buckets for food scrapes
Cooking stations

Time

30-90 minutes, depending on recipe chosen, and possible variations.

Procedure

*Cooking activities require greater supervision and individual feedback. As

such, groups should be kept to a maximum of 10 students per leader. Choose the recipe with the teacher prior to the field trip to ensure that you select a recipe that is an appropriate level for the group. Choose recipes with minimal cooking or cutting for younger students, and more complex recipes for older or experienced students. Ask the teacher to check with the students or parents regarding food allergies, and ensure that you choose an inclusive recipe.

Require students to wash their hands before beginning.

1. Start by introducing the recipe to the students. Discuss each farm grown component, including the growing season, what part of the plant it is, and other uses for it.
2. Next, show the students the utensils and equipment that will be used, and review any safety concerns or techniques for their proper use.
3. Demonstrate the recipe step by step, allowing the students to complete each step before continuing to demonstrate the following step. Circulate between the students, helping with their use of the utensils and equipment and answering questions. Ensure that students are completing the recipe safely.
4. As students complete their recipes, check that all heat sources have been shut off, and all sharp cooking utensils are collected and accounted for.
5. Provide students with plates, bowls, or flatware as needed. Allow students time to eat, and if time permits, discuss successes and challenges they faced in the cooking process.
6. After they have eaten their food, students will clean the station at which they worked.

Variations:

Lead students around the farm to harvest the required ingredients. Provide a washing station for the ingredients.

Pair with a compost activity. Students will “feed” the compost with the food scrapes, and then learn about composting methods.

Parts of a Seed

Description

Students will explore the parts of seeds and their function using the example of a hiker as a stand-in. Once they have learned the basic parts of seeds, they will dissect a seed to see the actual components.

Standards

C11.1 Understand the anatomy and functions of plant systems and structures. **(CANR)**

F2.2 Diagram the seed's essential parts and explain the functions of each. **(CANR)**

G3.2 Label the seed's essential parts and describe their functions. **(CANR)**

Time

1 Hour

Materials

Lima beans, soaked in water overnight, three per student

Backpack

Rain jacket or poncho

Snack placed inside of a lunchbox (to be placed inside backpack)

Water bottle with straw (to be placed inside backpack)

Hat (to be placed inside backpack)

Hand lens, one per student

Tape and labels for seed parts (Seed Coat, Cotyledon, Embryo, New Leaves, and Roots)

Advanced Preparation: Soak lima beans in water overnight.

Procedure

1. Tell the students to pretend that they are about to go on a hike. Ask the student how you protect yourself from the wind, rain and cold. (Answer: a coat.) Ask for a student volunteer to wear the coat. Explain that a seed also has a coat and when conditions are right for growth, the seed will absorb water and split the seed coat. This is called germination. Put the label “Seed Coat” on the coat and have the student remove the coat and place it on a table with the label showing.
2. Ask the students what a hiker would need on a long hike. (Answer: Lunch or a snack.) Have the student open the backpack and find a lunch box with the snack. Explain that seeds also store food and they store it in a cotyledon, which provides the initial energy for the plant to germinate and grow. Attach the “Cotyledon” label to the lunchbox, and place the lunchbox on a table with the label showing.
3. What else does a hiker need? (Answer: Water.) Have a student remove the water bottle from the backpack. How do plants get water? (Answer: Roots.) Attach “Roots” to the straw of the water bottle, and place the water bottle on a table with the label showing.
4. What else might the hiker need on a hot day? (Answer: A hat.) Attach the “New Leaves” label to the hat. Have a student remove the hat from the backpack and compare the hat to the first green leaves a seedling puts out to absorb sunlight. Talk about photosynthesis. Place the hat on a table with the label showing.
5. Explain that the leaves and roots grew from the embryo inside the seed. Put the sign “Embryo” on the student. Review the various parts of the seeds using the props.
6. Have the students break into pairs. Explain that they will dissect a seed. Hand out four seeds and two hand lenses to each pair. Demonstrate how to take the seed apart.
7. As they are dissecting the seed, ask the following questions: Have them rub the seed between their fingers to see if they can remove the outer covering. What is this and what is its function? (Answer: seed coat and it protects the seed within it.) Inside the seed coat are large fleshy structures. What are these and their function? (Answer: Cotyledons used for stored food to help

the plant grow until it produces true leaves. Cotyledons die back as the true leaves emerge to carry out photosynthesis. Question: What happens if you plant a seed too deep? Have the students break open the seed, carefully splitting it lengthwise. What do they see in the inner curve of the cotyledons? (Answer: A tiny plant or embryo, made up of the first true leaves and the root.) Have them use the hand lens and draw the seed and label the parts.

*Adapted from OAEC

Healthy Soils

Description

Students will interact directly with soil from 3 different locations. They will perform a series of soil typing tests, and a water permeability test at each location. Once they have results from each test, the students will come together to share their findings, and discuss how human impact can affect soil health.

Standards

MS-ESS3- 3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. **(NGSS)**

HS-ESS3- 4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. **(NGSS)**

Materials:

1 large coffee can per group
1 liter bottles filled with water- 4 per group
1 Stopwatch/timer- 1 per group
Clipboards- 1 per student
Worksheet (attached)- 1 per student
Small shovels- 1 per group

Time

1 hour

Procedure

1. Break students into groups of 3-4. Distribute the can, the water bottles, a timer, clipboards, and the worksheets.
2. Review the instructions on the worksheet with the students. Students will run the test at three different locations. Encourage the students to choose a variety of locations, such as roads, agricultural fields, and natural areas. At the first location, tell the students to press the coffee can into the ground a few centimeters deep. They should have the timer ready to start

as soon as the water touches the ground. Slowly pour a bottle of water (1L) onto the soil. Stop timing when all the water has drained into the soil. Record the time. Once the permeability test is completed, perform each of the soil type tests, and record the data.

3. Students will repeat the entire procedure for the second and third locations.
4. As each group finishes their tests, they will review the results from each location and draw conclusions about the permeability and soil type of each location and how that might affect surface water runoff and erosion at that location.
4. Student groups will share their results with the class. Discuss common trends, and the human influences that can impact soil permeability.

Locate three different sites in the designated area. Choose from sites with a variety of conditions, such as roads, fields, and natural areas. At each location you will perform a test to find the soil type and the soil's permeability. To find the permeability of the soil press the can a few centimeters deep into the soil. One group member will be in charge of keeping time, while another will be in charge of pouring the water. Rotate duties at each site. Pour all of the water from one of the bottles into the can. The timer should start as soon as the water is poured and the time will continue running until all of the water has been absorbed into the soil. Record a description of the location and the amount of time that it took for the soil to absorb the water in the table below.

Site Description	Time (Minutes)	Type (Clay, silt, sand)

What site had the fastest time?

The slowest?

What conclusions can you make about how the conditions of the site affect the time it takes for water to move through the soil?

To find the soil type, perform the following test at each site, and record your data on the table. Each member of the group will perform all of the tests.

1. Feel test:

Rub some moist soil between fingers. Does the soil feel gritty, smooth, or sticky?

- Sand feels gritty.
- Silt feels smooth.
- Clays feel sticky.

2. Squeeze test:

Squeeze a moistened ball of soil in the hand.

- Coarse texture soils (sand or loamy sands) break with slight pressure.
- Medium texture soils (sandy loams and silt loams) stay together but change shape easily.
- Fine textured soils (clayey or clayey loam) resist breaking.

3. Ribbon test:

Squeeze a moistened ball of soil out between thumb and fingers.

- Ribbons less than 1 inch
 - o Feels gritty = coarse texture (sandy) soil
 - o Not gritty feeling = medium texture soil high in silt
- Ribbons 1 to 2 inches
 - o Feels gritty = medium texture soil
 - o Not gritty feeling = fine texture soil
- Ribbons greater than 2 inches = fine texture (clayey) soil

Energy Transfer Tag

Description

In this activity, students will learn about energy transfer in ecosystems, including the roles of producers (plants), primary consumers (herbivores), secondary consumers (carnivores), and tertiary consumers (apex predators). This activity will work best with a larger group of students.

Standards

MS-LS1- 6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. **(NGSS)**

MS-LS2- 1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. **(NGSS)**

MS-LS2- 2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. **(NGSS)**

Materials:

Colored flags or ribbons

Plants = 3 green flags per student

Herbivores = 3 blue flags per student

Carnivore = 3 red flags per student

Time

1 Hour

Procedure

1. Discuss the role of producers (plants), primary consumers (herbivores), secondary consumers (carnivores), and tertiary consumers (apex predators) in an ecosystem.
2. Three different scenarios will be carried out:
 - Many plants, several herbivores, few carnivores, one apex predators
 - Several plants, several herbivores, few carnivores, multiple apex predators

- Few plants, many herbivores, many carnivores, multiple apex predators
3. To play: break students into the group that they will be representing; plants, herbivores, carnivores, and apex predators. Hand out the appropriate flags to each group. Explain the basic rules of the game. At the end of each scenario, shuffle the students into roles they have not yet played.
 4. The playing field will be divided into three sections. The first section will be composed of plants and herbivores. The goal of the herbivores is to obtain at least three flags from the plants and attach them to their own belts. Give the students representing the herbivores 3-4 minutes to collect as many green flags as possible. At the end of that time, any students who do not have at least 3 flags will not have gotten enough energy, and will have to sit down. The students who have 3 or more flags will continue the game.
 5. The second section of the field will consist of the remaining herbivores and the carnivores. The goal of the carnivores is to obtain 2 green flags and 2 blue flags from the herbivores. Give the students representing the carnivores 3-4 minutes to collect their flags. At the end of that time, any herbivore that was able to keep at least 1 blue flags will remain in the game. Any carnivore that was able to collect at least 2 each of the blue and green flags will remain in the game.
 6. The third section of the game will consist of the remaining herbivores and carnivores, with the apex predator(s) introduced. The goal of the apex predator is to collect at least one each of the green, blue, and red flags. As the apex predator is collecting flags, the carnivores will continue to collect as many blue and green flags as possible. Give the students 3-4 minutes to collect their flags. At the end of that time, any student who did not collect the required flags, or lost all of their flags, will not have survived the game.
 7. At the end of each scenario, ask students to reflect on their challenges and successes in their roles. How many from each level survived to the next round? How many survived to the end of the game?
 8. Discuss the concept of carrying capacity, and how the amount of available energy at each trophic level will determine the number of higher-level consumers that will survive.
 9. Ask students what role each trophic level plays in maintaining a healthy and balanced ecosystem.

Activity Background: Energy Transfer Tag

1st level: Producers

Producers are plants, and make their own food.

2nd level: Primary consumers

Primary consumers are herbivores, and eat plants (producers).

3rd level: Secondary consumers

Secondary consumers are carnivores, and eat primary consumers (herbivores).

4th level: Tertiary consumers

Tertiary consumers are apex predators, and eat primary and secondary consumers (herbivores and carnivores).

In a food chain or food web, energy is transferred from the lowest level to the highest level. Energy is created at the producer level as plants absorb energy from the sun, and create food for themselves by photosynthesizing. Only a small amount of energy from each level is transferred to the next level, about 10%. Because there is such a discrepancy in the energy that gets transferred between levels, the organisms that occur in the lower levels are more numerous than those at higher levels. Availability of food energy at the producer level will dictate the carrying capacity of high trophic level organisms. Carrying capacity refers to the population that can be sustained based on the availability of resources in a given location.

Farm Tour

Description

Students will participate in a farm tour, and learn about the different ecosystems on the farm.

Standards

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. **(NGSS)**

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. **(NGSS)**

MS-LS1- 5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. **(NGSS)**

Time

1 Hour

Procedure

1. Gather the group together before beginning the farm tour, ask what they know about ecosystems.
2. Begin to discuss the definition of an eco-system. Start by explaining the definition of an individual, population, community, and finally an eco-system.

Individual- any single living thing or organism.

Population- a group of interbreeding individuals of a single species that live in a specific geographic region at a given time.

Community- Includes all of the populations in a specific area at a given time.

Ecosystem- All living and non-living organisms in a specific area at a given time.

3. Describe the difference between an aquatic and terrestrial eco-system. Then lead into how agricultural, creek, and forest eco-systems are similar and different.

4. While walking around the farm, draw students' attention to their surroundings. Question them as to what differentiates ecosystems from one another.

High School

Activities for students in High School

Composting

Description

Students will investigate samples from various locations in the compost pile, looking for similarities and differences in the insects present at each location. Additionally, students will learn about the benefits that plants receive from compost, and the importance of decomposers in ecosystems.

Standards

HS-LS2- 6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. **(NGSS)**

HS-ESS3- 4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. **(NGSS)**

Materials:

Light-colored trays or pans
Plastic tweezers
Plastic spoons
Jars for temporary sorting and display of organisms
Magnifying glasses or hand lenses
Petri dish for use with magnifying lenses
Fresh compost samples, from multiple locations within the pile

Time

30 minutes

Procedure

1. Take samples of compost from various locations in the heap. Spread each compost sample in a large tray or pan, or on a large piece of paper, preferably light in color for maximum contrast. Have multiple stations set up for each sample. As the students make observations, ask questions such as: Are there some organisms that you find near the surface and others only at greater depths? What role do you think these insects play in the composting process?

*When sorting through the compost, students should use soft tweezers,

plastic spoons, or other instruments that will not hurt the organisms.

2. Flashlights and magnifying glasses or hand lenses can be used to enhance the observation. The larger organisms, such as worms, centipedes, millipedes, beetles, and other large insects can easily be seen with the naked eye, but they can be observed more closely under the magnifying glass or hand lens. Place samples of the compost in jars and observe them under a magnifying glass or hand lens.

3. Throughout the observation process, discuss the importance of compost for plants, the functions of macro- and micro- organisms on the compost breakdown process, and the environmental benefits of composting food waste.

Variations

In combination with a Farm to Fork, Eating a Rainbow, you-pick, or other activity that involves the production of food waste, lead students through the process on starting a well balanced compost pile, with an emphasis on carbon and nitrogen containing waste, proper moisture, and aeration. (30 minutes)

Eating a Rainbow

Description

Students will participate in a scavenger hunt on the farm to find and eat fruits and vegetables of every color of the rainbow. Additionally, students will understand the nutritional characteristics of fruits and vegetables based on their color.

Standards

HS 1.4.N Describe dietary guidelines, food groups, nutrients, and serving sizes for healthy eating habits.

HS 7.3.N Identify strategies for eating more fruits and vegetables.

Materials:

Worksheet (attached)
Baskets
Harvest tools
Washing station
Cutting boards
Knives

Time

30 minutes- Scavenger hunt
30 minutes- Snack

Procedure

1. Discussion- Ask the students the following questions: What are the colors of the rainbow? What fruits and vegetables are each of those colors? Discuss how different colors in fruits and vegetables represent the presence of different vitamins and nutrients. These nutrients work together to keep our bodies healthy. This is why it is important to eat a rainbow of fruits and vegetables!
2. Students break into pairs or small groups. Each group receives a worksheet with examples of fruits and vegetables in each color category. Review the information on the worksheet with the students.

3. Lead students to the scavenger hunt area, and remind them of the rule to follow around the crops. Distribute baskets that they can use to collect their harvested items.
4. Explain that they are to explore the area, and identify crops that are colors of the rainbow. When the students find a crop that matches one of the colors, they will call the activity leader or parent volunteer to their location, who will verify that the students have identified the appropriate part of the plant and assist with harvest.
5. Allow students to move freely through the scavenger hunt, assisting as needed with identification of crops and with appropriate harvest methods.
6. Recall the students from the scavenger hunt area, and proceed to the washing station, where students will wash their harvested fruits and vegetables.
7. If necessary, cut the fruits and vegetables, or allow the students to do so. Give students the opportunity to sample each of the fruits and vegetables that they harvested.

Variations:

Break students into teams for each color of the rainbow (i.e. Red team, Orange team, Green team, Purple team, White team.) Each team will search for and harvest as many fruits and vegetables of that color as possible. At the end of the scavenger hunt, the groups will come back together and share their fruits and vegetables with the class.



RED

TOMATO PEPPER RASBERRY STRAWBERRY CHERRY



ORANGE

ORANGE PUMPKIN SWEET POTATO CARROT SQUASH



WHITE

CAULIFLOWER ONION GARLIC POTATO WHITE CORN



GREEN

SPINACH AVOCADO KIWIFRUIT LETTUCE CUCUMBER



PURPLE

RED GRAPE FIG BLACKBERRY EGGPLANT BLUEBERRY

Eating a Rainbow- Activity Background-

Red fruits and vegetables are colored by natural plant pigments called “lycopene” or “anthocyanins.” Lycopene may help reduce risk of several types of cancer.

Anthocyanins act as powerful antioxidants that protect cells from damage.

Antioxidants are linked with keeping our hearts healthy. Examples:

Red peppers

Beets

Pomegranates

Cherries

Cranberries

Raspberries

Strawberries

Tomatoes

Watermelon

Orange/yellow fruits and vegetables are usually colored by natural plant pigments called “carotenoids.” Beta-carotene is converted to vitamin A, which helps maintain healthy mucous membranes and healthy eyes. Scientists have also reported that carotenoid-rich foods can help reduce risk of cancer, heart disease and can improve immune system function. Citrus fruits like oranges are not a good source of vitamin A, but they are an excellent source of vitamin C. Examples:

Peaches

Apricots

Squash

Cantaloupe

Persimmons

Carrots

Pineapple

Lemons

Mangoes

Oranges

Sweet potatoes

Green fruits and vegetables are colored by natural plant pigment called “chlorophyll.” Some members of the green group, including spinach and other dark leafy greens, green peppers, peas, cucumber and celery, contain lutein. Lutein works to help keep eyes healthy. The “indoles” in broccoli, cauliflower, cabbage and other cruciferous vegetables may help protect against some types of cancer. Leafy greens such as spinach and broccoli are excellent sources of folate, a B vitamin that helps reduce risk of birth defects. Some examples of the green group include:

Artichokes
Kiwi
Asparagus
Lettuce
Avocados
Green beans
Broccoli
Brussels sprouts
Green pepper
Green cabbage
Spinach
Cucumbers
Zucchini

Blue/purple fruits and vegetables are colored by natural plant pigments called “anthocyanins.” Anthocyanins act as powerful antioxidants that protect cells from damage. They may help reduce risk of cancer, stroke and heart disease. Examples:

Blackberries
Purple grapes
Blueberries
Eggplant
Figs
Plums
Red/purple cabbage

White fruits and vegetables are colored by pigments called “anthoxanthins.” They may contain health-promoting chemicals such as allicin, which may help lower cholesterol and blood pressure and may help reduce risk of stomach cancer and heart disease. Some members of the white group, such as bananas and potatoes, are good sources of potassium. Examples:

Bananas
Onions
Cauliflower
Parsnips
Garlic
Potatoes
Turnips
Mushrooms

Farm to Fork

Description

Students will have the opportunity to make a snack made primarily from components grown on site, while practicing safe food handling skills.

Standards

HS 1.6.N Explain how to keep food safe through proper food purchasing, preparation, and storage practices. **(CA Health)**

HS 7.3.N Identify strategies for eating more fruits and vegetables. **(CA Health)**

Materials:

Subject to change based on age, recipe, and season; generally:

Seasonally appropriate farm-produced ingredients, based on recipe
Cooking utensils needed for the recipe (knives, cutting boards, bowls, etc.)
Eating utensils (plates, bowls, forks, etc.)
Napkins
Hand washing station
Buckets for food scrapes
Cooking stations

Time

30-90 minutes, depending on recipe chosen, and possible variations.

Procedure

*Cooking activities require greater supervision and individual feedback. As such, groups should be kept to a maximum of 10 students per leader. Choose the recipe with the teacher prior to the field trip to ensure that you select a recipe that is an appropriate level for the group. Choose recipes with minimal cooking or cutting for younger students, and more complex recipes for older or experienced students. Ask the teacher to check with the students or parents regarding food allergies, and ensure that you choose an inclusive recipe.

Require students to wash their hands before beginning.

1. Start by introducing the recipe to the students. Discuss each farm grown component, including the growing season, what part of the plant it is, and other uses for it.
2. Next, show the students the utensils and equipment that will be used, and review any safety concerns or techniques for their proper use.
3. Demonstrate the recipe step by step, allowing the students to complete each step before continuing to demonstrate the following step. Circulate between the students, helping with their use of the utensils and equipment and answering questions. Ensure that students are completing the recipe safely.
4. As students complete their recipes, check that all heat sources have been shut off, and all sharp cooking utensils are collected and accounted for.
5. Provide students with plates, bowls, or flatware as needed. Allow students time to eat, and if time permits, discuss successes and challenges they faced in the cooking process.
6. After they have eaten their food, students will clean the station at which they worked.

Variations:

Lead students around the farm to harvest the required ingredients. Provide a washing station for the ingredients.

Pair with a compost activity. Students will “feed” the compost with the food scrapes, and then learn about composting methods.

Parts of a Seed

Description

Students will explore the parts of seeds and their function using the example of a hiker as a stand-in. Once they have learned the basic parts of seeds, they will dissect a seed to see the actual components.

Standards

C11.1 Understand the anatomy and functions of plant systems and structures. **(CANR)**

F2.2 Diagram the seed's essential parts and explain the functions of each. **(CANR)**

G3.2 Label the seed's essential parts and describe their functions. **(CANR)**

Time

1 Hour

Materials

Lima beans, soaked in water overnight, three per student

Backpack

Rain jacket or poncho

Snack placed inside of a lunchbox (to be placed inside backpack)

Water bottle with straw (to be placed inside backpack)

Hat (to be placed inside backpack)

Hand lens, one per student

Tape and labels for seed parts (Seed Coat, Cotyledon, Embryo, New Leaves, and Roots)

Advanced Preparation: Soak lima beans in water overnight.

Procedure

1. Tell the students to pretend that they are about to go on a hike. Ask the student how you protect yourself from the wind, rain and cold. (Answer: a coat.) Ask for a student volunteer to wear the coat. Explain that a seed also has a coat and when conditions are right for growth, the seed will absorb water and split the seed coat. This is called germination. Put the label "Seed Coat" on the coat and have the student remove the coat and place it on a table with the label showing.
2. Ask the students what a hiker would need on a long hike. (Answer: Lunch or a snack.) Have the student open the backpack and find a lunch box with the snack. Explain that seeds also store food and they store it in a cotyledon, which provides the initial energy for the plant to germinate and grow. Attach the "Cotyledon" label to the lunchbox, and place the lunchbox on a table with the label showing.
3. What else does a hiker need? (Answer: Water.) Have a student remove the water bottle from the backpack. How do plants get water? (Answer: Roots.) Attach "Roots" to the straw of the water bottle, and place the water bottle on a table with the label showing.
4. What else might the hiker need on a hot day? (Answer: A hat.) Attach the "New Leaves" label to the hat. Have a student remove the hat from the backpack and compare the hat to the first green leaves a seedling puts out to absorb sunlight. Talk about photosynthesis. Place the hat on a table with the label showing.
5. Explain that the leaves and roots grew from the embryo inside the seed. Put the sign "Embryo" on the student. Review the various parts of the seeds using the props.
6. Have the students break into pairs. Explain that they will dissect a seed. Hand out four seeds and two hand lenses to each pair. Demonstrate how to take the seed apart.
7. As they are dissecting the seed, ask the following questions: Have them rub the seed between their fingers to see if they can remove the outer covering. What is this and what is its function? (Answer: seed coat and it protects the seed within it.) Inside the seed coat are large fleshy structures. What are these and their function? (Answer: Cotyledons used for stored food to help

the plant grow until it produces true leaves. Cotyledons die back as the true leaves emerge to carry out photosynthesis. Question: What happens if you plant a seed too deep? Have the students break open the seed, carefully splitting it lengthwise. What do they see in the inner curve of the cotyledons? (Answer: A tiny plant or embryo, made up of the first true leaves and the root.) Have them use the hand lens and draw the seed and label the parts.

*Adapted from OAEC

Healthy Soils

Description

Students will interact directly with soil from 3 different locations. They will perform a series of soil typing tests, and a water permeability test at each location. Once they have results from each test, the students will come together to share their findings, and discuss how human impact can affect soil health.

Standards

MS-ESS3- 3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. **(NGSS)**

HS-ESS3- 4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. **(NGSS)**

Materials:

1 large coffee can per group
1 liter bottles filled with water- 4 per group
1 Stopwatch/timer- 1 per group
Clipboards- 1 per student
Worksheet (attached)- 1 per student
Small shovels- 1 per group

Time

1 hour

Procedure

1. Break students into groups of 3-4. Distribute the can, the water bottles, a timer, clipboards, and the worksheets.
2. Review the instructions on the worksheet with the students. Students will run the test at three different locations. Encourage the students to choose a variety of locations, such as roads, agricultural fields, and natural areas. At the first location, tell the students to press the coffee can into the ground a few centimeters deep. They should have the timer ready to start as soon as the water touches the ground. Slowly pour a bottle of water (1L) onto the soil. Stop timing when all the water has drained into the soil.

Record the time. Once the permeability test is completed, perform each of the soil type tests, and record the data.

3. Students will repeat the entire procedure for the second and third locations.
4. As each group finishes their tests, they will review the results from each location and draw conclusions about the permeability and soil type of each location and how that might affect surface water runoff and erosion at each location.
4. Student groups will share their results with the class. Discuss common trends in the results, and the human influences that can impact soil permeability.

Locate three different sites in the designated area. Choose from sites with a variety of conditions, such as roads, fields, and natural areas. At each location you will perform a test to find the soil type and the soil's permeability. To find the permeability of the soil press the can a few centimeters deep into the soil. One group member will be in charge of keeping time, while another will be in charge of pouring the water. Rotate duties at each site. Pour all of the water from one of the bottles into the can. The timer should start as soon as the water is poured and the time will continue running until all of the water has been absorbed into the soil. Record a description of the location and the amount of time that it took for the soil to absorb the water in the table below.

Site Description	Time (Minutes)	Type (Clay, silt, sand)

What site had the fastest time?

The slowest?

What conclusions can you make about how the conditions of the site affect the time it takes for water to move through the soil?

To find the soil type, perform the following test at each site, and record your data on the table. Each member of the group will perform all of the tests.

1. Feel test:

Rub some moist soil between fingers. Does the soil feel gritty, smooth, or sticky?

- Sand feels gritty.
- Silt feels smooth.
- Clays feel sticky.

2. Squeeze test:

Squeeze a moistened ball of soil in the hand.

- Coarse texture soils (sand or loamy sands) break with slight pressure.
- Medium texture soils (sandy loams and silt loams) stay together but change shape easily.
- Fine textured soils (clayey or clayey loam) resist breaking.

3. Ribbon test:

Squeeze a moistened ball of soil out between thumb and fingers.

- Ribbons less than 1 inch
 - o Feels gritty = coarse texture (sandy) soil
 - o Not gritty feeling = medium texture soil high in silt
- Ribbons 1 to 2 inches
 - o Feels gritty = medium texture soil
 - o Not gritty feeling = fine texture soil
- Ribbons greater than 2 inches = fine texture (clayey) soil

Energy Transfer Tag

Description

In this activity, students will learn about energy transfer in ecosystems, including the roles of producers (plants), primary consumers (herbivores), secondary consumers (carnivores), and tertiary consumers (apex predators). This activity will work best with a larger group of students.

Standards

HS-LS2- 1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. **(NGSS)**

HS-LS2- 2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. **(NGSS)**

HS-LS2- 4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. **(NGSS)**

HS-LS2- 4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. **(NGSS)**

Materials:

Colored flags or ribbons
Plants = 3 green flags per student
Herbivores = 3 blue flags per student
Carnivore = 3 red flags per student

Time

1 Hour

Procedure

1. Discuss the role of producers (plants), primary consumers (herbivores), secondary consumers (carnivores), and tertiary consumers (apex predators) in an ecosystem.

2. Three different scenarios will be carried out:

- Many plants, several herbivores, few carnivores, one apex predators
- Several plants, several herbivores, few carnivores, multiple apex predators
- Few plants, many herbivores, many carnivores, multiple apex predators

3. To play: break students into the group that they will be representing; plants, herbivores, carnivores, and apex predators. Hand out the appropriate flags to each group. Explain the basic rules of the game. At the end of each scenario, shuffle the students into roles they have not yet played.

4. The playing field will be divided into three sections. The first section will be composed of plants and herbivores. The goal of the herbivores is to obtain at least three flags from the plants and attach them to their own belts. Give the students representing the herbivores 3-4 minutes to collect as many green flags as possible. At the end of that time, any students who do not have at least 3 flags will not have gotten enough energy, and will have to sit down. The students who have 3 or more flags will continue the game.

5. The second section of the field will consist of the remaining herbivores and the carnivores. The goal of the carnivores is to obtain 2 green flags and 2 blue flags from the herbivores. Give the students representing the carnivores 3-4 minutes to collect their flags. At the end of that time, any herbivore that was able to keep at least 1 blue flags will remain in the game. Any carnivore that was able to collect at least 2 each of the blue and green flags will remain in the game.

6. The third section of the game will consist of the remaining herbivores and carnivores, with the apex predator(s) introduced. The goal of the apex predator is to collect at least one each of the green, blue, and red flags. As the apex predator is collecting flags, the carnivores will continue to collect as many blue and green flags as possible. Give the students 3-4 minutes to collect their flags. At the end of that time, any student who did not collect the required flags, or lost all of their flags, will not have survived the game.

7. At the end of each scenario, ask students to reflect on their challenges and successes in their roles. How many from each level survived to the next round? How many survived to the end of the game?

8. Discuss the concept of carrying capacity, and how the amount of available energy at each trophic level will determine the number of higher-level

consumers that will survive.

9. Ask students what role each trophic level plays in maintaining a healthy and balanced ecosystem.

Activity Background: Energy Transfer Tag

1st level: Producers

Producers are plants, and make their own food.

2nd level: Primary consumers

Primary consumers are herbivores, and eat plants (producers).

3rd level: Secondary consumers

Secondary consumers are carnivores, and eat primary consumers (herbivores).

4th level: Tertiary consumers

Tertiary consumers are apex predators, and eat primary and secondary consumers (herbivores and carnivores).

In a food chain or food web, energy is transferred from the lowest level to the highest level. Energy is created at the producer level as plants absorb energy from the sun, and create food for themselves by photosynthesizing. Only a small amount of energy from each level is transferred to the next level, about 10%. Because there is such a discrepancy in the energy that gets transferred between levels, the organisms that occur in the lower levels are more numerous than those at higher levels. Availability of food energy at the producer level will dictate the carrying capacity of high trophic level organisms. Carrying capacity refers to the population that can be sustained based on the availability of resources in a given location.

References:

Activity Background- Eating a Rainbow:

Garden-Robinson, Julie. *What Color Is Your Food?:Taste a Rainbow of Fruits and Vegetables for Better Health*. Fargo, ND: NDSU Extension Service, 2003. *USDA: National Agricultural Library*. North Dakota State University. Web. 02 June 2016.

Senses on the Farm:

Activity adapted from LifeLab.org- Six of One, Half Dozen of the other
<http://www.lifelab.org/wp-content/uploads/2010/07/sixofone.pdf>

Parts of a Seed:

Activity Adapted from Occidental Arts and Ecology Center- A seed is a plant in a box with its lunch
<https://www.oaec.org/wp-content/uploads/2014/10/A-Handful-of-Seeds.pdf>

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