The Outdoor Garden Classroom

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

1

First Grade Lessons

Seeds
(2nd Edition)

www.greenourplanet.org

THE OUTDOOR GARDEN CLASSROOM

Hands-On STEM Teaching Curriculum, K-5

Lessons are to Nevada State and Next Generation Standards

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The Outdoor Garden Classroom: Hands-On STEM Curriculum K-5 was funded by The American Honda Foundation and created by teachers from the Clark County School District in Southern Nevada in Association with Green Our Planet and Three Square.

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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* Each lesson is followed by a suggested curriculum map with possible English Language Arts and Math extensions as a guide for shorter chunks of time. The schedule for September, October and November can be repeated in January, Feburary and March.

A first grader will learn to identify the key stages of the life cycle of plants and review the basic needs for each stage of a plant's life. Students will learn to identify how young plants and their parents are both similar and different. Students will explore how seeds create food for humans and animals. Students will learn the life cycle of a plant by planting seeds early in the growing season and harvesting seeds at the end of the season.

SEPTEMBER

Objectives
Students will learn to identify the parts of a seed and how a seed grows.
NV Standards: (1)1.1, (1)1.2, (1)1.3, (1)1.4, (1)4.1, (1)4.2, (1)4.3
Next Gen Standards: 1-LS1-2

Overview
Students will understand that a seed is part of the life cycle of a plant. Students will explore the different parts of a seed. Students will learn that the number of seeds varies in different fruits/vegetables. Students will investigate and observe how a seed grows.

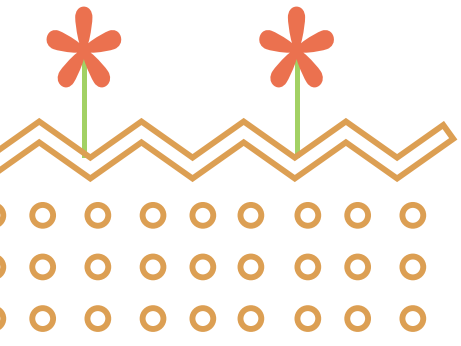
- Lesson 1 – What is a Seed?
- Lesson 2 – The Parts of a Seed
- Lesson 3 – How Does a Seed tGrow Without Soil
- Lesson 4 – How Does a Seed Grow in Soil

OCTOBER

Focus
Students will observe the maturing and fruiting of plants in the garden.
NV Standards: (1)1.1, (1)1.2, (1)4.1
Next Gen Standards: 1-LS1-1, 1-LS1-2

Overview
Students will use their senses in the garden. Students will compare and contrast different plants.

- Lesson 5 – Using Our Senses to Investigate How Seeds Grow
- Lesson 6 – Compare and Contrast Plants



NOVEMBER

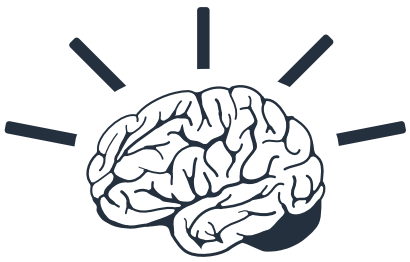
Focus
Students will learn how to harvest seeds.
NV Standards: (1)1.1, (1)1.2, (1)4.1
Next Gen Standards: 1-LS1-1, 1-LS1-2

Overview
Students will collect seeds from vegetables and fruit grown in the garden. These lessons can be revisited in the spring when the students harvest food from the garden in February, April and May.

- Lesson 7 – Seed Collecting
- Lesson 8 – Seed Harvesting

Lesson One

Garden Senses



BRAIN BREAKS!

1. Seed Planter Students will squat down to dig a hole, stand up, squat down to plant the seed then stand up, squat down to cover the seed, squat down and water the seed.

2. Fruit/Veggie Talk Teacher will give class a color and students turn to a partner taking turns going back and forth naming a vegetable or fruit of that color, Partner "A" starts. Repeat until partners can no longer name fruits or vegetables of that color.

3. Apple Picker Students reach above their heads, alternating arms to pretend to pick apples from the apple tree. Teacher can time students for 10 sec. – 1 min asking students to count the number of apples they pick.

4. Syllable Snacks Students will work with a partner. Partner "A" will name a garden snack. Partner "B" will have to identify how many syllables are in the name of the snack. Students will repeat switching roles. Play as many rounds as possible in a given time frame.

5. Plant "Party" Students stand up pretending to be a plant. Teacher calls out part of plant (roots-feet, stem-legs, leaves-body, flowers-head). Students touch that part of body where that part of the plant would be located.

6. The Harvester Students bend down and pick a crop, stand up to bundle it, then throw it over their shoulder. Repeat for as many rounds as possible in given time frame.

7. The Watering Can Students stand up and alternately move their hands across their bodies pretending to water their plants.

8. Insect Cycle Students will act out the life cycle of an insect. Egg- student is curled up on floor, Pupa- students crawl around, Larva- students stand up straight and still, Adult- students flap wings and fly.

9. Freeze Students walk/dance around room as teacher calls out vegetable names. Students have to freeze when teacher calls out a fruit.

10. Corn Shuffle Students bend down to pick the corn, then stand up to shuck the corn, eat the corn, then throw it over their shoulder into compost pile.

11. Earthworm Students lay on floor and do the earthworm shuffle by wiggling on the floor.

12. 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). Go back and forth repeating chant as long as desired.

13. Insect Talk Students will turn to a partner, taking turns going back and forth naming a garden insect. Repeat until partners can no longer name insects.

OVERVIEW

Students will use their senses in the garden.

OBJECTIVE

- Students will investigate how seeds grow in the garden using their senses.
- Students will identify parts of the plants using their senses.

STANDARD

Nevada State Standards

(1)1.1 Record observations and explanations using pictures, words and numbers.

(1)1.2 Use equipment to gather information.

(1)4.1 Identify observable characteristics of plants.

Next Generation Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

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

TIME

Two 20 – 30 minute sessions

TEACHER BACKGROUND

As plants grow, many of them have distinguishing features. For example, before many plants mature, you are able to identify them by their smell. Have fun with this lesson and see if the students are able to identify plants without labels.

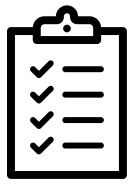
Plan on teaching this lesson in September when some plants are ready to harvest like summer squash, melons, okra, tomatoes, cucumber, eggplant, beans, and peppers.

MATERIALS

- Garden plants
- Science Journals
- Magnifying Glasses

QUESTIONS

- What are some ways we can experience the garden?



PROCEDURES

1. In the outdoor garden classroom, the teacher will draw a *single bubble Thinking Map* on the posterboard.

2. In the center of the bubble, the teacher will write the word **garden.**

3. In each of the other five bubbles, the teacher will write **hear, taste, see, touch, and smell.**

4. The teacher will then ask the students to make observations using sight, smell, and sounds.

5. The teacher will instruct the students to close their eyes and listen to the garden sounds.

6. After two minutes, the teacher will record observations of what the students heard on the bubble map.

7. The teacher will then have the student quietly take in the smells of the garden.

8. After two minutes, the teacher will record observations of what the student smelled on the bubble map.

9. The teacher will then have the students look around for two minutes and take in all of the sights of the garden. **HINT:** Have the students use their hands like binoculars to help them focus on the sights. Compare and contrast what they see with their 'human binoculars' vs. looking just with their eyes.

10. The students will then ask the students to feel the plants in the garden by gently touching the leaves on the plants. **HINT:** Have students feel the plants with their eyes closed vs. eyes open.

11. Teacher will record observations of what the students saw and felt on the bubble map.

12. The teacher will instruct the students to taste a pre-selected sample of a fruit or herb grown in the garden (like mint, thyme, parsley, oregano, etc.)

13. Teacher will record observations of what the students tasted on the bubble map.

14. The students will copy the Thinking Map from the board into their science journals.

ASSESSMENT

- Teacher will check the science journals to see if the bubble maps are complete.

MODIFICATIONS

- Students can work in pairs with one child leading the other child (blindfolded).
- Go out to the garden at different times of the day to see if the smells, sounds, and tastes are different.

DIGGING DEEPER

- After 2 weeks have passed, ask the students to compare the radishes that they planted in their cups inside to the radishes planted outside in their garden.

NUTRITION FACTS

- The sense of smell and taste are closely tied to nutrition: anywhere from 80-90% of a meal's flavor comes from one's nose.

LESSON MAP

Next Generation Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

1-LS1-2 Read texts and media to determine patterns in the behavior of parents and offspring that help the offspring survive.

ELA

- **Reading**
  - RI.1.1 Ask and answer questions about key details in a text.
  - RI.1.2 Identify the main topic and retell key details of a text.
  - R.1.10 With prompting and support, read informational texts that are appropriately complex for the grade level.
- **Writing**
  - W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).

Math

1.NBT.B.3 Compare two two-digit numbers based on the meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <

1.NBT.B.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between additions and subtractions. Relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones and that sometimes it is necessary to compose a ten.

1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count. Explain the reasoning used.

1.NBT.C.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. Relate the strategy to a written method and explain the reasoning used.

Lesson 1: Garden Senses

Day 1

Observe sights, sounds, and smells in the outdoor garden classroom and record on a single bubble Thinking Map on posterboard. (See Example)

Day 2

Observe sense of touch and taste in the outdoor garden classroom and record on the bubble map from Day 1.

Day(s) 2

Math Using the shapes bar graph (see science extension), answer questions on making 10 and making comparisons.

See **Garden Shapes Bar Graph Questions** SES below.

Day(s) 1 or 2

GLL Literacy connection: Read *Five Senses* by Aliki and/or *Giggly-Wiggly Snickety-Snick* by Robyn Sopraner

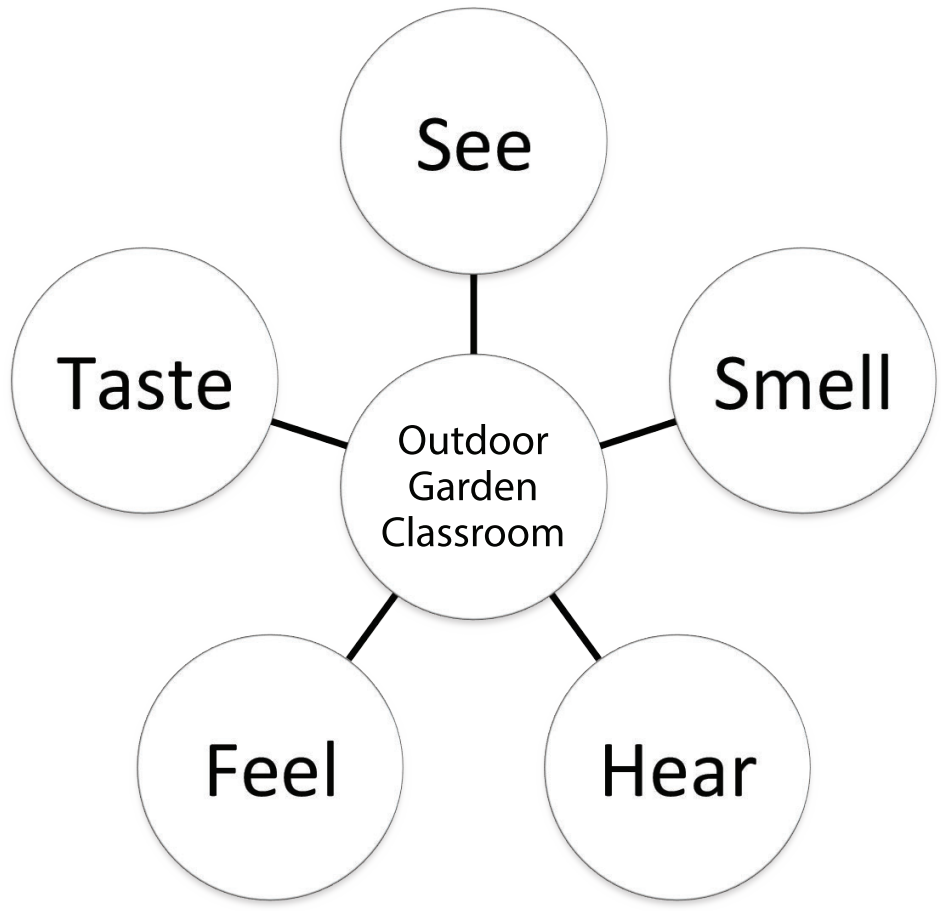
Write a senses poem based on a **Single Bubble Thinking Map.**

Day(s) 1

Science/Social Studies Extension
Complete a bar graph identifying familiar shapes in the garden.

SINGLE BUBBLE THINKING MAP EXAMPLE

Draw out on a large poster board that can be taken out to the garden and back into the classroom as you work.



Name:_____

Date: _____

GARDEN SHAPES BAR GRAPH QUESTIONS

Using the bar graph you made as a class in the outdoor garden classroom, answer the following questions.

1. How many more triangles would you need to find in the garden to make 10?

_____ + _____ = 10

How many ▲ did you find? How many more do you need to make 10?

2. How many more squares would you need to find in the garden to make 10?

_____ + _____ = 10

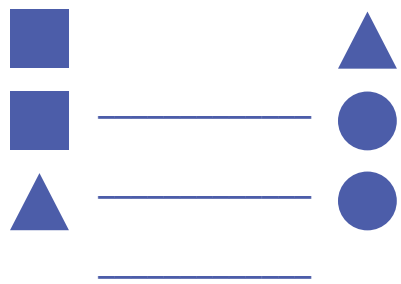
How many ■ did you find? How many more do you need to make 10?

3. How many more circles would you need to find in the garden to make 10?

_____ + _____ = 10

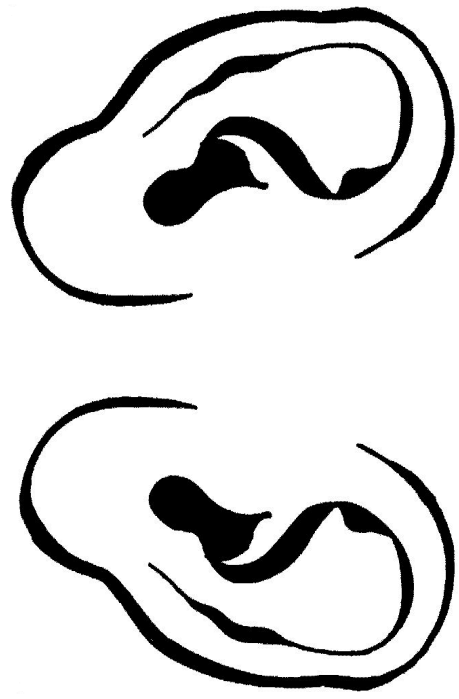
How many ● did you find? How many more do you need to make 10?

4. Fill in the blank with <, =, or > to show how the number of shapes you found in the garden compare to each other.



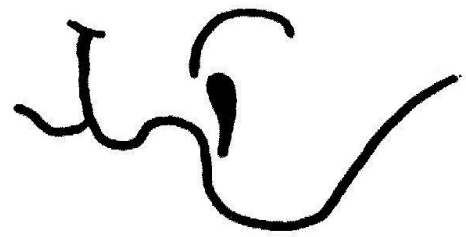
Senses in the Garden Book

Name



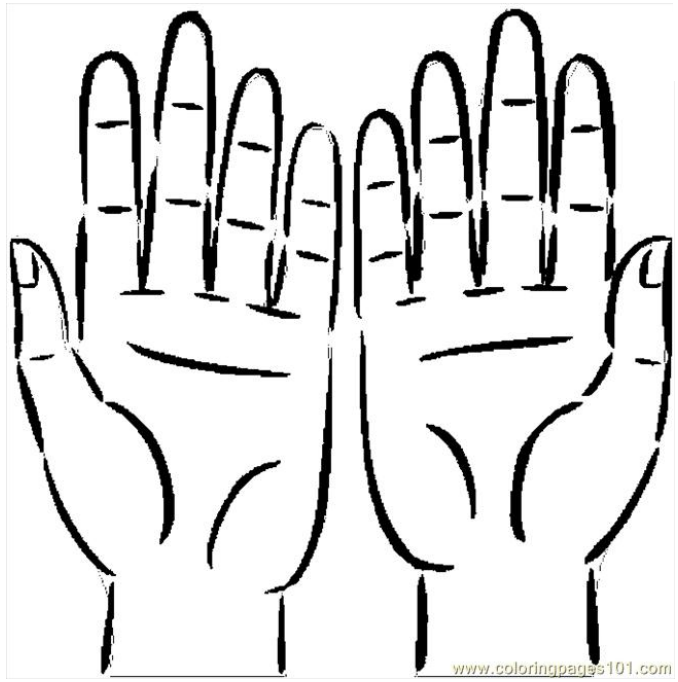
In the garden I hear

In the garden I see



In the garden I smell

In the garden I taste



In the garden I feel

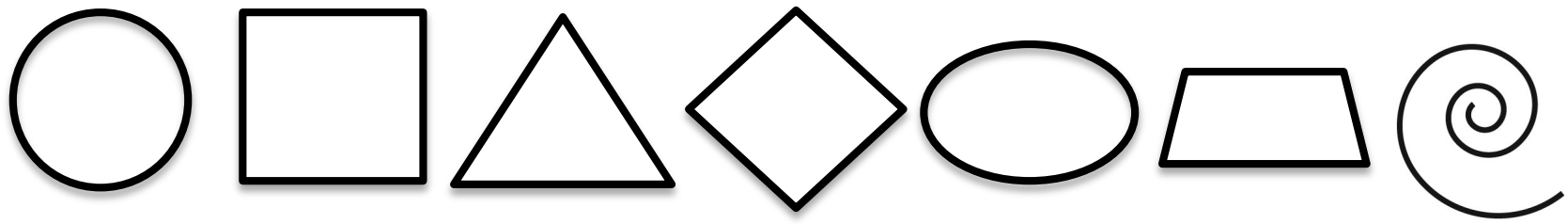
My favorite things about the garden

The garden

Shapes in the Garden

Color in one square for each shape you find in the garden.

Name _____



WAYS TO EXPLORE YOUR SENSES IN THE GARDEN

If you want children to focus on one specific sense while out in the garden, here's an easy and inexpensive way.

MATERIALS

- Toilet paper roll or paper towel roll cut in half – one for each student.

To explore sight Have the students use the roll like a telescope to focus in on a particular element in the garden. Students can also make binoculars with the rolls.

http://www.doodlecraftblog.com/2012/08/spy-gear-binoculars-little-boy-crafts.html

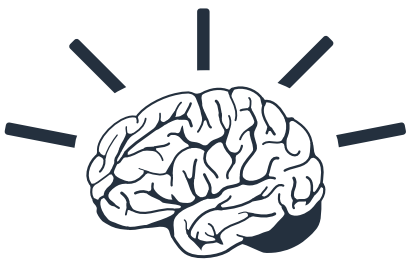
To explore sound The students can 'enhance' their hearing by holding the roll up to one of their ears. Let the students compare/contrast their hearing in the garden using the roll next to their ear and listening without the roll.

http://laynasavage.blogspot.com/2012/09/diy-stethoscope.html

To explore sound The students can hold the roll up to their noses when smelling various elements in the garden. See the example above.

Lesson Two

What is a Seed?



BRAIN BREAKS!

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13. Insect Talk Students will turn to a partner taking turns going back and forth naming a garden insect. Repeat until partners can no longer name insects.

OVERVIEW

Students will be introduced to seeds.

OBJECTIVE

- Students will examine seeds.
- Students will learn that the number of seeds varies in different fruits and/or vegetables.

STANDARD

Nevada State Standards

(1)1.1 Record observations and explanations using pictures, words and numbers.

(1)1.2 Use equipment to gather information.

(1)1.3 Make predictions based on observed patterns.

(1)1.4 Ask questions based on observations and interactions.

Next Generation Standards

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

TIME

45-minute session

TEACHER INFORMATION

Seeds are amazing little packages of life – hidden inside a seed is a tiny plant just waiting to grow. Everything a new plant needs to start growing is inside these tiny capsules. A seed is the plant that contains the embryo for a future plant. The embryonic plant is enclosed in a protective outer covering called the seed coat. The seed contains food that supplies the energy and materials for growth until the plant grows its first leaves above the ground. Some seeds can be eaten and some cannot. Some of the seeds we eat are: sunflower seeds, peanuts, popcorn, etc.

Here are some interesting facts about seeds:

- Not all plants have seeds involved in their reproductive cycle.
- Not all seeds need sunlight to start growing (This would be fun to explore with the class).
- The shapes and sizes of seeds are numerous, from small like the mustard seed to the large coconut seed.

- The size and shape of the seed are usually an indication of the way the seed is dispersed.

MATERIALS

- A variety of seeds: peanuts, peas, beans (pintos, lima, kidney, etc.), popcorn, and coconuts, to name a few
- A variety of fruits and vegetables that contain seeds (lemons, grapefruits, watermelons, green peppers, green beans)
- Have one fruit/vegetable per small group to compare/contrast the number of seeds it contains with other groups. (Example: one group has an apple to examine, another group has a tomato, another group has a green pepper, another has some watermelon, etc.)
- Magnifying glasses
- Paper plate for each small group
- Chart paper
- Crayons
- Science Journals

QUESTIONS

- How is it possible to hold 500 radishes in your hand at the same time? (You may use a different type of vegetable/fruit instead of radishes if you don't think the students will know what radishes are).

PROCEDURE

1. Have students write/draw in their journals the answer to the question.
2. Share the answers with a partner or with the whole group.
3. Teacher will show the various fruits and vegetables that have been selected to observe. Teacher will then cut fruit/vegetables to show the seeds.
4. Teacher will ask students what all of them have in common. (They all have seeds).
5. Teacher asks students what they think a seed is. The students can discuss with a partner and then enter their answers in their science journals.
6. Teacher will then have students examine at least 3 different seeds using magnifying glasses. They will then record their observations in their science journals. Encourage the students to observe the sizes, shapes, and colors.

7. Teacher will then break the class into small groups. Teacher will give each group a fruit/vegetable and a paper plate.

8. Teacher will have the small groups 'open' their fruit/vegetable to examine. Remove the seeds found in their particular 'specimen'. The students are then to label the paper plate with the name of their fruit/vegetable and place the seeds and the fruit/vegetable on the plate.

9. Students are to count the seeds they have found in their fruit/vegetable. Teacher and students will then design a graph comparing the number of seeds found in the various 'specimens'.

10. Class discussion as to the results of the graph.

11. Students will take one of the seeds they have observed and tape it in their science journals. Teacher will explain that having samples such as the seeds is important for recording data in their journals.

12. Class will then go out into the garden to explore seeds, to see if there are any in the garden or even in other places on campus. Discuss any findings the students have.

ASSESSMENT

- Class participation
- Science journal entries:
  - Date
  - Name of the Lesson: Seeds
  - Picture is labeled

MODIFICATIONS

- Have students bring in seeds that they might have at home.
- Make a checklist for students to use if they go to the grocery store on the different types of seeds they find there.

DIGGING DEEPER

- Sometimes it can be difficult to space tiny seeds. Try using some toilet paper as seed tape. Place the seeds along the center of a lightly misted strip of TP. Fold the sides over and re-mist, then place in your garden.
- Make sure that you read labels for what seeds need. Different types of seeds require different environments in order to flourish.

DID YOU KNOW?

- Eight baskets filled with fruit preserved for more than 3,000 years were discovered by Egyptian archaeologists in Tutankhamun's tomb.

NUTRITION FACTS

- Fruits contain seeds and are the ovaries of plants, while vegetables are plant parts (flower, stem, root, leaf) that don't contain seeds. Many fruits and vegetables are often misclassified, such as avocados, bell peppers, cucumbers, squash, and tomatoes, which are actually considered fruits!

LESSON MAP

Next Generation Standards

1-LS1-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

ELA

- **Reading**
  - RI.1.1 Ask and answer questions about key details in a text.
- **Writing**
  - W.1.7 Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).
  - W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

Math

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

Lesson 2: What is a Seed?

Day 1

- Preview by reading *The Tiny Seed*
- Bring in sample seeds, students observe
- Anchor Chart: What is a seed?
- Prepare Science journals (see attached)

Day 2

- Write the definition of seeds in journal
- Illustrate 3 fruit/vegetables bearing seeds in journal
- Cut fruit/vegetables; students examine and illustrate each seed

Day 3

- Count and sort seeds
- Make graph with data
- Find, observe, and sort seeds found in garden

Day(s) _____

Math Addition with seeds **(see attached)**

Addition planting seeds in garden bed **(see attached)**

Day(s) 1, 3

GLL Write "I see" sentence stems in journals about the seeds. Write comparison sentences.
Literacy connection
The Tiny Seed by Eric Carle

Day(s) 2

Science/Social Studies Extension Garden Observation

Sort seeds that humans eat for nutrition. Students can bring seeds from home **(see attached).**

LESSON MAP

During September you can try and save seeds from beans, melons, or pumpkins that have been drying since summer. For beans: allow the pod to dry fully on the dead plant, then store in a glass jar with rice to absorb any moisture. Melons/pumpkins: Remove the seeds and pulp and rinse under water until seeds are clean. A light fermentation with a little water can sometimes help in the cleaning process. Simply add 1 cup of water for every cup of seeds and pulp and let sit in a warm place for 2-3 days, stirring daily. Then rinse under water and allow seeds to dry on a plate, cloth or similar clean surface. After rinsing, use a 1/2" or 1/4" screen to help with cleaning. Melon seeds will remain viable for 4-6 years under cool and dry storage conditions.

Name:_____

Date: _____

SCIENCE JOURNAL

A seed is _____

_____

Draw an illustration of a fruit that contains one or more seeds.	Draw an illustration of a seed.	How many seeds did you count?

Name:_____

Date: _____

GARDEN OBSERVATION: SEARCHING FOR SEEDS

Today in the Outdoor Garden Classroom, I saw a seed!

This is what the plant looked like:

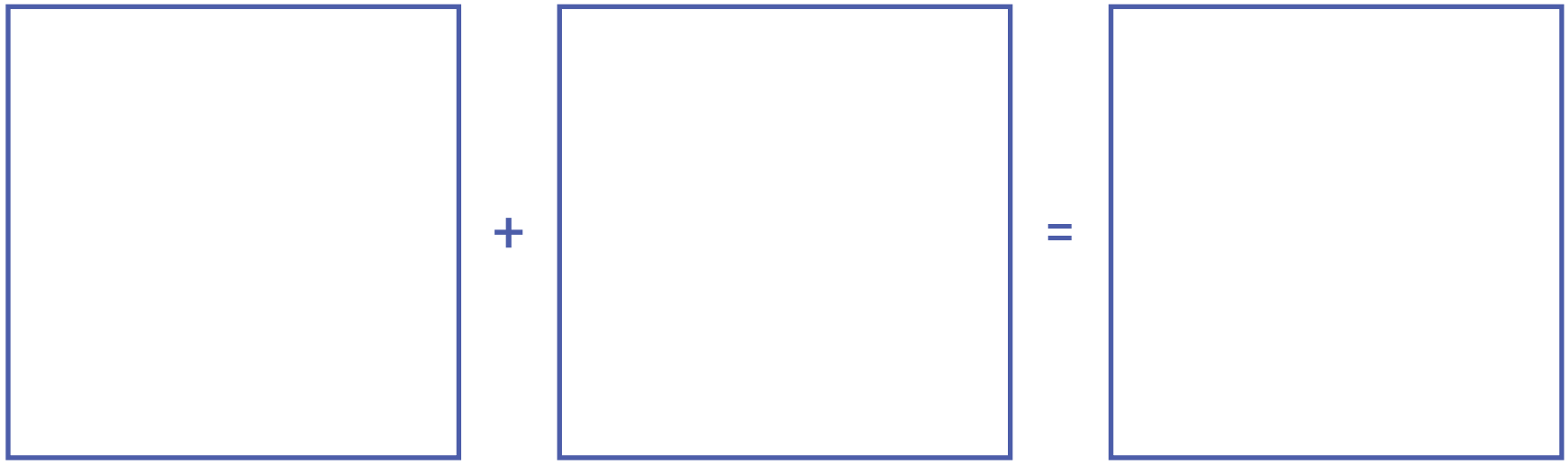
This is what the seed looked like:

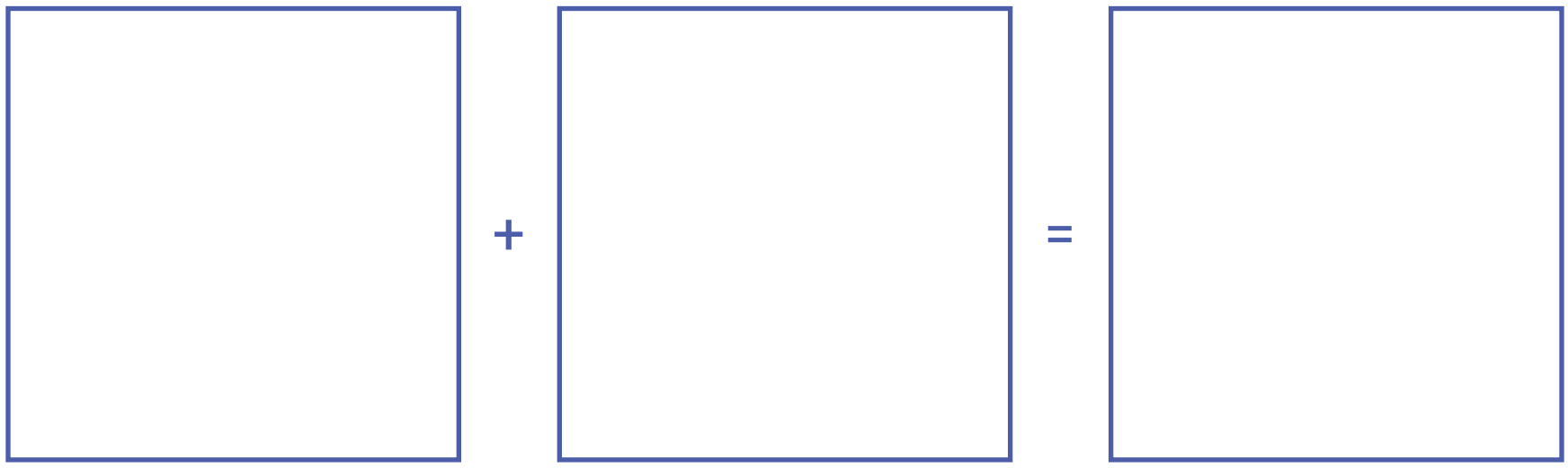
This is what the plant looked like:

Name:_____

Date: _____

SEED ADDITION





Name:_____

Date: _____

PLANTING SEEDS IN THE GARDEN

We planted __ seeds in the first row. Then, we planted ____ seeds in the second row.
How many seeds did we plant in all?

Draw a model.

We planted __ seeds in the first row. Then, we planted ____ seeds in the second row. How many seeds did we plant in all?

Draw a model.

SEEDS: THE PERFECT PACKAGE

OVERVIEW

This lesson will provide students with the concept of seeds and how they function.

Next Generation Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their parts to help them survive, grow, and meet their needs.

ELA

- **Reading**
  - RI.1.1 Ask and answer questions about key details in the text.
- **Writing**
  - W.1.7 Participate in shared research and writing projects.
  - W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

Math

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

MATERIALS

- Boxes (can be any type of box: shoebox, empty tissue box, empty cereal box, etc.)
- Choose from the following options
  - Items to represent basic human needs
    - Food
    - Water
    - Shelter
    - Air
    - Protection
    - Transportation
    - Light
  - Paper – Pencil – Colored Pencils/Crayons – Scissors – Various other craft supplies
  - Magazines to cut out pictures from

SEEDS: THE PERFECT PACKAGE (CONTINUED)

PROCEDURE

1. Ask the students what they would need if they were going on a trip to another world. Tell the students they will need to bring everything to ensure their survival. The box represents the students' survival package.

2. Write down the student responses on the board/chart paper. As the teacher, you might need to ask guiding questions. **For example:** *What if there is no food in this new world? What if the atmosphere is different from the Earth's atmosphere?*

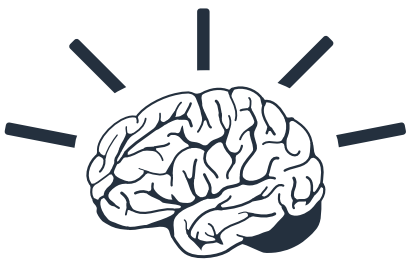
3. Working in groups or individually, students will create (by drawing or cutting out magazine pictures) everything they will need to live in their new world. They will place the items in their survival packages.

4. Once the activity is complete, have the students share their projects.

5. Explain how seeds are the perfect package. Each seed contains all the necessary items needed for survival with the addition of air, water and sun.

Lesson Three

The Parts of a Seed



BRAIN BREAKS!

1. Seed Planter Students will squat down to dig a hole, stand up, squat down to plant the seed then stand up, squat down to cover the seed, squat down and water the seed.

2. Fruit/Veggie Talk Teacher will give class a color and students turn to a partner taking turns going back and forth naming a vegetable or fruit of that color, Partner "A" starts. Repeat until partners can no longer name fruits or vegetables of that color.

3. Apple Picker Students reach above their heads, alternating arms to pretend to pick apples from the apple tree. Teacher can time students for 10 sec. – 1 min asking students to count the number of apples they pick.

4. Syllable Snacks Students will work with a partner. Partner "A" will name a garden snack. Partner "B" will have to identify how many syllables are in the name of the snack. Students will repeat switching roles. Play as many rounds as possible in a given time frame.

5. Plant "Party" Students stand up, pretending to be a plant. Teacher calls out part of plant (roots-feet, stem-legs, leaves-body, flowers-head). Students touch that part of body where that part of the plant would be located.

6. The Harvester Students bend down and pick a crop, stand up to bundle it, then throw it over their shoulder. Repeat for as many rounds as possible in given time frame.

7. The Watering Can Students stand up and alternately move their hands across their bodies pretending to water their plants.

8. Insect Cycle Students will act out the life cycle of an insect. Egg- student is curled up on floor, Pupa- students crawl around, Larva- students stand up straight and still, Adult- students flap wings and fly.

9. Freeze Students walk/dance around room as teacher calls out vegetable names. Students have to freeze when teacher calls out a fruit.

10. Corn Shuffle Students bend down to pick the corn, then stand up to shuck the corn, eat the corn, then throw it over their shoulder into compost pile.

11. Earthworm Students lay on floor and do the earthworm shuffle by wiggling on the floor.

12. 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). Go back and forth repeating chant as long as desired.

13. Insect Talk Students will turn to a partner taking turns going back and forth naming a garden insect. Repeat until partners can no longer name insects.

OVERVIEW

Students will explore the different parts of a seed.

OBJECTIVE

- Students will learn that seeds have different parts with different functions.

STANDARD

Nevada State Standards

(1)1.1 Record observations and explanations using pictures, words and numbers.

(1)1.2 Use equipment to gather information.

Next Generation Standards

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

TIME

45-minute session (Some preparation done the day before the actual class.)

TEACHER INFORMATION

Seeds may seem like a dry and lifeless item, but in reality, they are very much alive and essential to all living things. Seeds are the *embryo* (the undeveloped form of the adult plant) containing the information to grow another plant like its parent. *Dormant seeds* are those seeds that are not ready to *germinate* (grow) until the right factors are in place: light, oxygen, and water. When these elements are in place, the seed will then begin to germinate. In other words, germination is the sprouting or the growing of the seed. Another factor affecting germination is the viability of the seed. Predators/diseases, fires, floods, extreme temperatures, or just old age can damage the viability of a seed.

The parts of a seed are: (See diagram below)

- Seed Coat: the outer membrane of the seed. It is usually hard to protect the embryo inside from injury or from drying out.
- Hilum: a scar on the seed coat that indicates the place where the seed was attached to the fruit.
- Micropyle: a tiny opening in the seed coat where the pollen entered the seed and caused it to mature. This is also the area where the action takes place when germination occurs.
- Radicle: Forms a tiny root.

- Hypocotyl: Grows into an early stem.
- Epicotyl: Takes the shape of a tiny leaf.
- Cotyledon: The large part of the seed that provides the food for the new plant. In many plants, it develops two leaves. These are the leaves seen that first emerge from the soil. As the plant continues to grow, the cotyledons fall off and the true leaves grow.

(from: http://www.abcteach.com/documents/experiment-hands-on-science-seeds-7012)

MATERIALS

- A variety of bean seeds: pinto, kidney, lima, black beans, etc.
  - The day before, soak half of the beans. (Soaking makes the beans easier to dissect)
  - Leave the other half of the beans dry so that each student will have a dry bean to compare with the wet version of the bean.
- Magnifying glass
- Paper towel or paper plate
- Toothpicks
- Science Journal

QUESTIONS

- How many parts does a seed have? Draw the parts.

PROCEDURE

1. Have students answer the question in their science journals. They can share within small groups.
2. While class is in small groups, teacher will give each student a soaked bean, a dry bean and a toothpick.
3. Teacher will have the students compare and contrast the dry/wet beans using their different senses (visual, touch, smell: don't let them taste them yet). Students will write/draw their observations in their journals.
4. Teacher will guide the class through a dissection of the beans. Teacher will show how the seed coat comes off easily. Students will do the same with their seeds and draw them in journals.

5. Teacher will continue showing the different parts of the seeds while the students dissect and enter their findings in their journals.

6. Once all of the parts have been identified, teacher will ask students to go back to their original answer to the question (How many parts does a seed have?). Students are to compare their answers with the findings from the dissection process.

7. Students can tape/glue the beans (both wet and dry) into their science journals.

ASSESSMENT

- Class participation
- Science journal entries:
  - Observations made
  - Labeled picture

MODIFICATIONS

- Have other types of bean seeds available for the students to dissect, draw and label.
- Teacher can work with individual students to help with science journals.

DIGGING DEEPER

- Check out the book, *A Fruit is a Suitcase for Seeds*. This book provides an introduction to seeds, their purpose, and growth.

DID YOU KNOW?

- Seed dispersal is when the seeds are taken from the parent plant. Most are caught in the wind, or moved by bees. Coconut seeds travel through the water from island to island.

NUTRITION FACTS

- Many nuts have seeds within their shells and there are different types of “nuts” that we eat (such as peanuts, pistachios, walnuts, pecans, and brazilnuts). Many times, the parts you buy from the store in a bag and eat are actually seeds taken from inside a nutshell.

LESSON MAP

Next Generation Standards

1-LS1-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

ELA

- **Reading**
  - RI.1.1 Ask and answer questions about key details in a text.
- **Writing**
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Math

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

Lesson 3: The Parts of a Seed

Day 1

- Read *From Seed to Plant* by Gail Gibbons.
- Define vocabulary (*seed coat, embryo, endosperm*).
- Distribute lima beans and sunflower seeds.
- Students will illustrate the external structures of the seeds and label with names the types of seeds.

Day 2

- Model how to dissect seed using materials.
- Distribute lima beans and sunflower seeds that were soaked overnight. Distribute toothpicks and paper plates.
- Allow students to use fingers or toothpicks to dissect seed in half.
- Students will illustrate the internal structures of the seeds and label with vocabulary terms.

Day 3

- Review journal diagrams of external and internal seed structures.
- Complete matching vocabulary and illustration (included in this lesson).

Day(s) 1

Math Measuring with Seeds

Day(s) 1, 3

GLL Vocabulary matching, record observations in journals using complete sentences.
Literacy connection
From Seed to Plant by Gail Gibbons

Day(s) 3

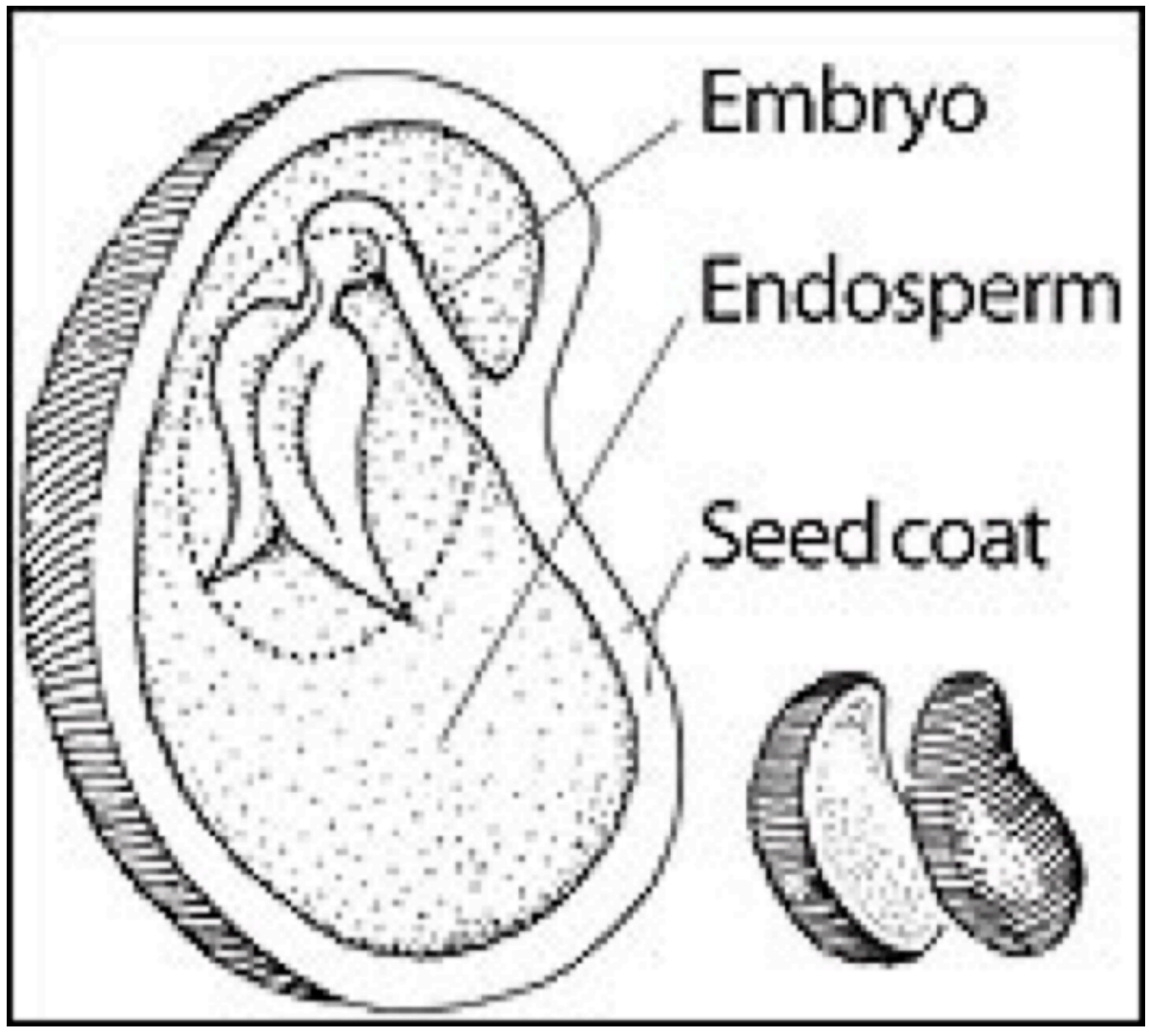
Science/Social Studies Extension
Take journals out to garden and draw observations of any seeds. Label with vocabulary.

Name:_____

Date: _____

PARTS OF A SEED

Cut out each box. Match the picture of the seed part to the name by gluing them next to the illustration.



Seed Coat	Endosperm
Embryo	

Name:_____

Date: _____

MEASURING WITH SEEDS

1. Draw a picture of the item you are measuring in the boxes below. Measure each item with your lima beans and write the amount on the line.

Paper clip

How many lima beans long? _____

Pencil

How many lima beans long? _____

2. Which seed is longer: the lima bean or the sunflower seed?

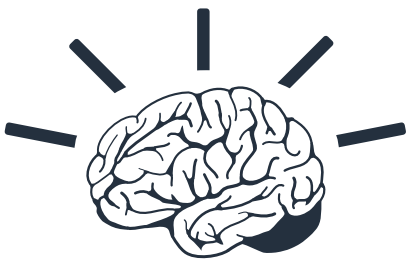
Bean Seed Dissection

1. What do you think the inside of your bean will look like when you open it?

2. Draw how your bean looked inside.

Lesson Four

Germination or Needs of a Seed



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13. Insect Talk Students will turn to a partner taking turns going back and forth naming a garden insect. Repeat until partners can no longer name insects.

OVERVIEW

- Students will understand the process of how a plant is generated from a seed.

OBJECTIVE

- Students will be able to observe and describe the process of germination both in and out of soil medium.

STANDARD

Next Generation Standards

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

TIME

4 days, 20-30 minutes each

TEACHER INFORMATION

Each student will start the process of germination with the tried-and-true bean seed in a bag experiment to observe the seed out of the soil. By day 3, students will start a seed in the soil to observe throughout Lesson 5 – Parts of a Plant. If the bean sprouts in the bag are healthy, you may also plant them in the soil or in the garden to compare and contrast growth between the “germinated in a bag” group and the “germinated in soil” group.

An ideal place to start seeds in the bags or cups is in the school garden. Messes are easier to clean up there! Also, plan on reading the story *A Seed is Sleepy* in the garden.

MATERIALS

- Parts of a seed vocabulary from Lesson 3
- Labeled seed diagram from Lesson 3
- Plastic sandwich bags (the kind that fold over instead of a ziploc seal) or empty CD Jewel cases (one per student)
- Bean seeds (any variety, 2-3 per student)
- Paper towels
- Permanent marker
- Seed observation journal

- *A Seed is Sleepy* by Dianna H. Aston and Sylvia Long
- Seed Need Bubble Map on a large posterboard
- Plastic cups with drainage holes poked in the bottom (you can use a thumbtack to do this) (one per student)
- Seed starting mix
- Grow lights or a spot near a windowsill that receives 4-6 hours of sunlight

QUESTIONS

- How do the parts of a seed help the seed germinate and continue growing?
- How do the first signs of germination compare to the mature plant?

PROCEDURE

- Day One

1. Teacher will prompt students to review vocabulary of parts of a seed and labeled diagrams in students' science journals and/or a class journal from Lesson 3.

2. Teacher will distribute supplies to start the "seed-in-the-bag" experiment (plastic bags, paper towels, bean seeds).

3. Teacher will model procedure one step at a time and assist students to complete each step afterward:

   - First: ask the students to find the one flower they notice right away. Discuss why as whole group or in small group.
   - Second: ask students to observe any activity around the flowers and document.
   - Ask students to observe several different flowers in the garden to see if there are any insects nearby.

4. Teacher will record observations in class journal and prompt students to do the same in their individual journals.

- Day Two

1. Teacher will preview with *A Seed is Sleepy* by Dianna H. Aston and Sylvia Long. Read out loud to students.

2. Teacher will display vocabulary of parts of a seed and labeled diagrams from Lesson 3 to review.

3. Teacher will guide students to complete the Seed Need Bubble Map based on what they read/heard in *A Seed is Sleepy*

4. Have students take 2-3 minutes to observe their seed in a bag and note any changes.

5. Teacher will record observations in class journal and prompt students to do the same in their individual journals. Guide students to identify any obvious differences and also to make sure their seeds have all of the “needs” met in order to germinate (sun, water)

▶ Day Three

1. Teacher will guide students to review the Seed Need Bubble Map from Day 2.

2. Prompt students to discuss with a partner what the seeds in a bag are missing (soil).

3. Ask students to discuss with a partner what they think will happen when a seed is planted in soil. Students may then write predictions in their science journals.

4. Teacher will distribute supplies to start the “seed in soil” experiment (cups with a few holes poked in the bottom, seeds).

5. Teacher will model procedure one step at a time and assist students to complete each step afterward:

   - Students will label cups with names
   - Scoop seed starting mix into cup, leaving about ½ inch from the top.
   - Plant seed only as deep as the seed is wide
   - Spray with water bottle; soil should be moist throughout
   - Place indoors in a sunny location or under grow lights (if under grow lights, be sure to keep the light as close as possible to the tops of the cups and move them up as the seedlings grow)

6. Teacher will record observations in class journal and prompt students to do the same in their individual journals. Guide students to clearly label these observations as “seed-in-soil”. Also, take the time to record observations of “seed-in-bag.”

7. Continue recording observations in journal until the seed in soil shows first signs of germination. Once germinated, move on to lesson 4.

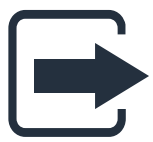
ASSESSMENT

- Seed Need Bubble Map
- Science journal observations

ADAPTATION

- Root Vue display boxes are a good way to show the process of germination in a better contained environment, especially if you are looking for a whole group example.

- In *A Seed is Sleepy*, the seeds on the first two full pages are also shown as mature plants at the end of the book. Write up index cards for each seed at the beginning of the story and have students match with the mature plant at the end by either marking a check mark on the index card or drawing a picture of the mature plant.



EXTENSION

- There are plants that can be grown without seeds (ferns and mosses are examples); however, there are some commonly-found plants that can be grown without seeds. Some of the examples are potato eyes, carrot tops, beet tops, celery, basil, and garlic to name a few.

TIME

20-30 minutes to introduce and set-up. The growth of these plants varies from several days to 2 weeks.

MATERIALS

- Tops of: beets, pineapples, carrots
- Eyes of: potatoes, yams
- Bottom 3 inches of celery stalk
- Basil stalks
- Garlic cloves

PROCEDURE

1. Teacher/students can bring in kitchen scraps (pineapple tops, carrot tops, beet tops, potato eyes, celery base, garlic cloves, basil stalks).
2. Students can conduct an experiment with the kitchen scraps: place some scraps in water and some of the scraps in soil.
3. Place the different plants in a sunny place.
4. Have the students keep a journal as to the progress of each plant.

BOOKS

- *Gardens from Garbage* by Handlesman, Judith F.
- *Plants Without Seeds* by Pascoe, Elaine
- *The Sweet Patootie Doll* by Calhoun, Mary
- *The Plant and Grow Project* Book by Dietly, Ulla
- *Beyond the Bean Seed* by Jurenka, Nancy Allen and Blass, Rosanne

DIGGING DEEPER

- Have students compare the difference between bulbs and tubers. You can show them by using garlic bulbs compared to potato tubers.
- Do a side by side comparison of monocot seeds to dicot seeds. Have the students record the differences.

DID YOU KNOW?

- Many compare monocots to dicots based on their leaf vein patterns, but there is much more to compare like the roots, stem, leaves, fruit, and parts of the plant you eat.

NUTRITION FACTS

- Some plants can be grown without seeds and are edible such as garlic, celery, and potatoes,

LESSON MAP

Next Generation Standards

1-LS1-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

ELA

- **Reading**
  - RI.1.1 Ask and answer questions about key details in a text.
- **Writing**
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Math

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

Lesson 4: Germination (needs of a seed)

Day 1

- Review vocabulary of parts of a seed and labeled diagrams
- Distribute supplies (plastic bags, paper towels, bean seeds) and demonstrate procedure (Label bag with name, spray towel with water in the bag, place seed between side of bag and paper towel, do not seal bag completely, put in sunny place)
- Record observations in journal (seed observation journal is included in this lesson)

Day 2

- Preview with *A Seed is Sleepy* by Dianna H. Aston and Sylvia Long
- Review vocabulary of parts of a seed and labeled diagrams
- Anchor Chart: What do seeds need to grow? (Seed Need Bubble Map)
- Record observations in Seed Observation Journal

Day 3

- Review Day 2 Anchor Chart
- Distribute planting supplies (cups, soil, seeds) and demonstrate planting procedure (Students will label cups with names, scoop soil into cup, plant seed only as deep as the side is wide, spray with water bottle)
- Record observations in Seed Observation Journal

Day 4

- Record observations in journal until seed in baggie shows first signs of germination. Once germinated, move on to lesson 5.

Day(s) 1-4

Math Measuring Your Garden SES

Day(s) 1-4

GLL Write "I see" sentences in Seed Observation Journal.

Literacy connection

A Seed is Sleepy by Dianna H. Aston and Sylvia Long

Day(s) 3-4

Science/Social Studies Extension

Garden observation of growing seeds and their needs.

Name:_____

Date: _____

MEASURING YOUR GARDEN

1. Choose 3 plants growing in your garden. Draw a picture and write the name of each plant, then measure each with a ruler and record the length below.

Plant: _____

Length: _____

Plant: _____

Length: _____

Plant: _____

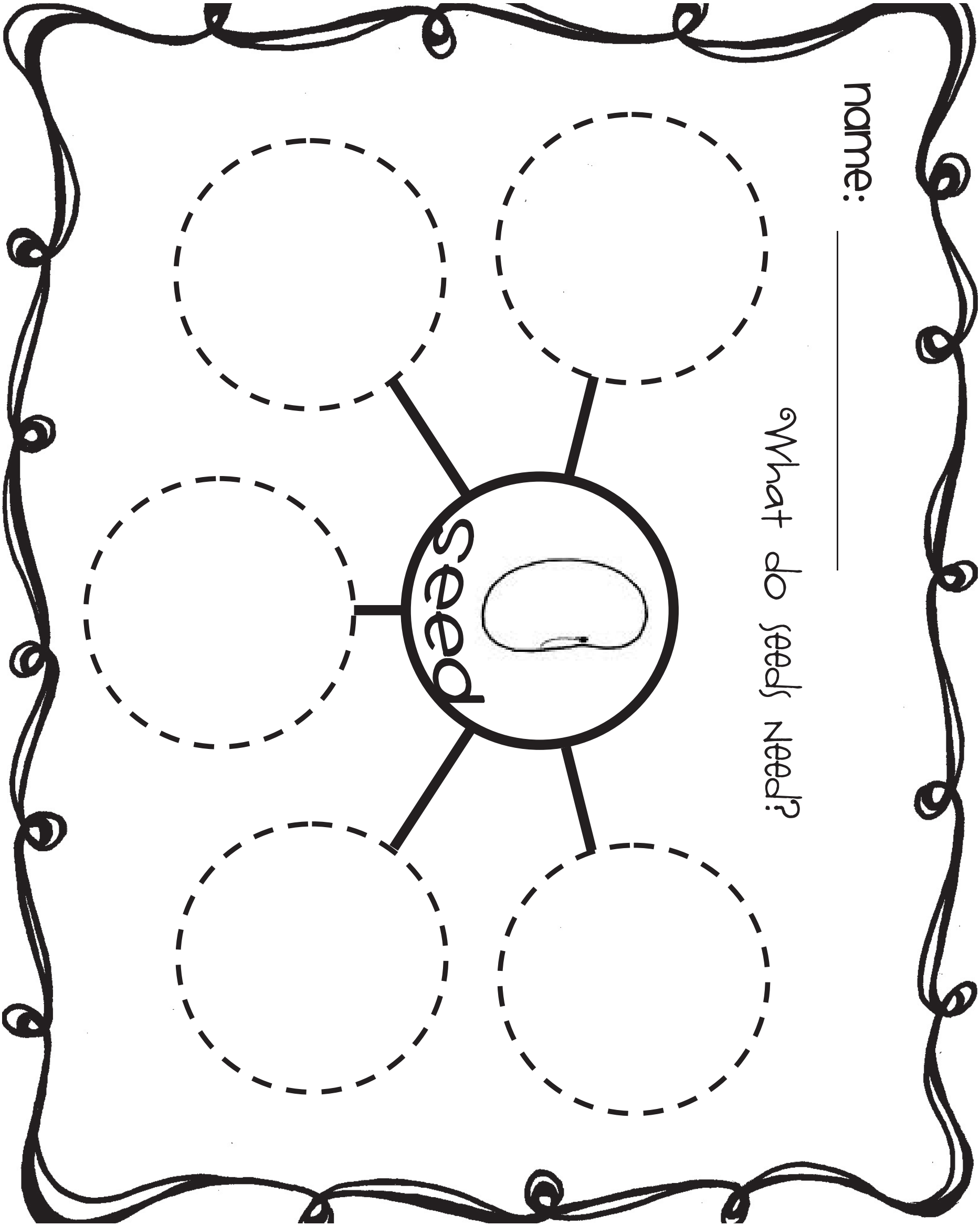
Length: _____

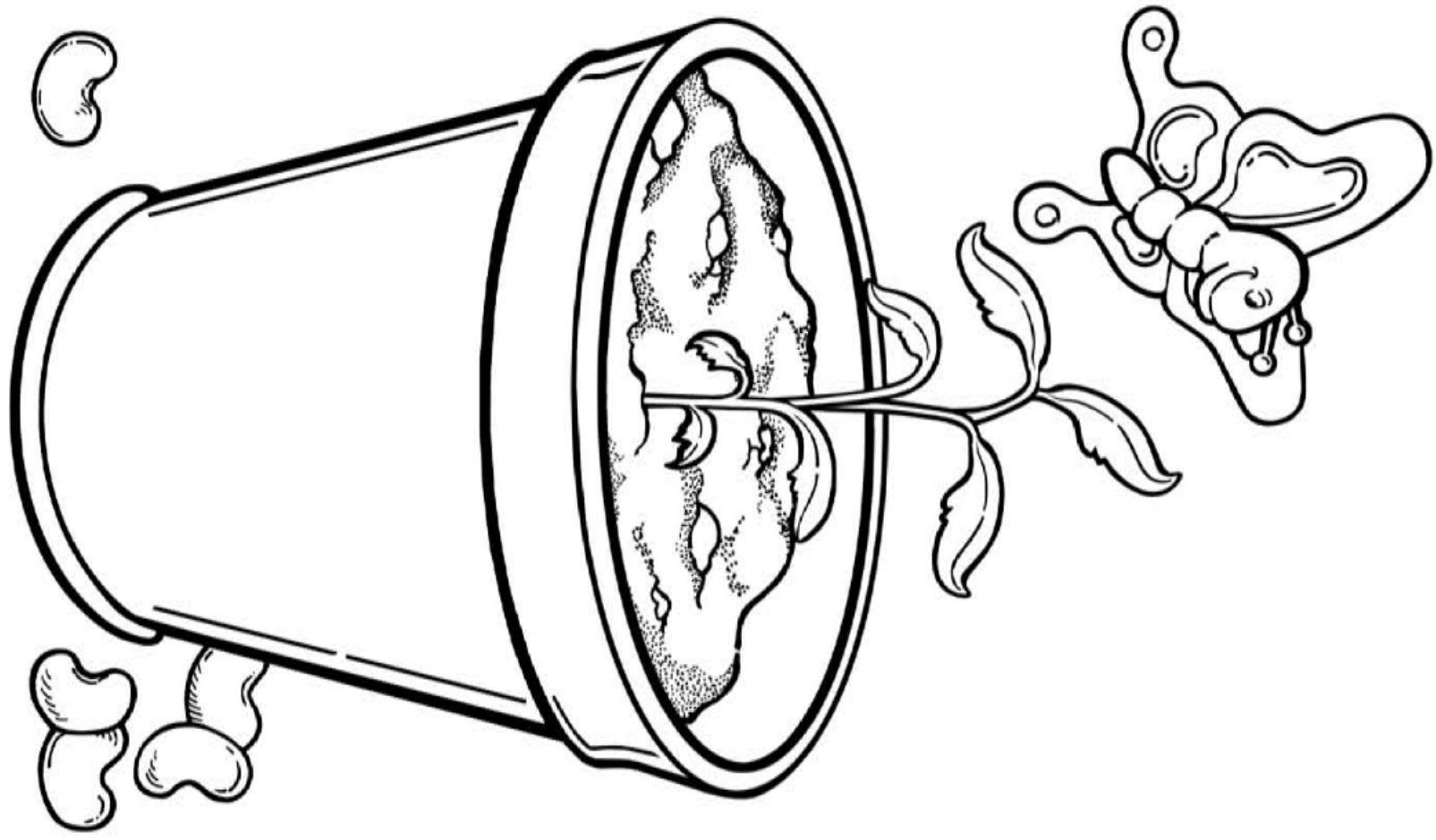
1. Which plant is the tallest?

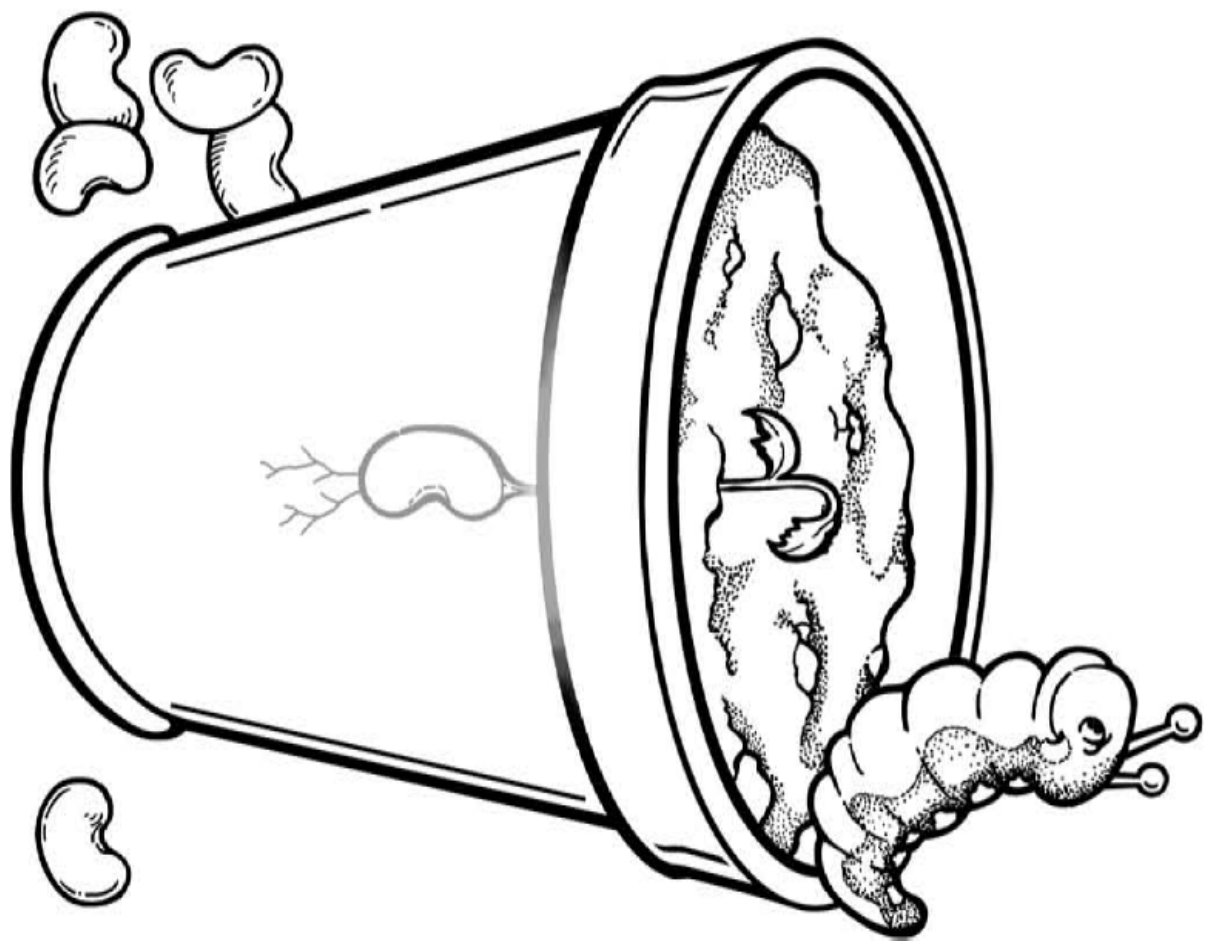
2. Which plant is the shortest?

name: _____

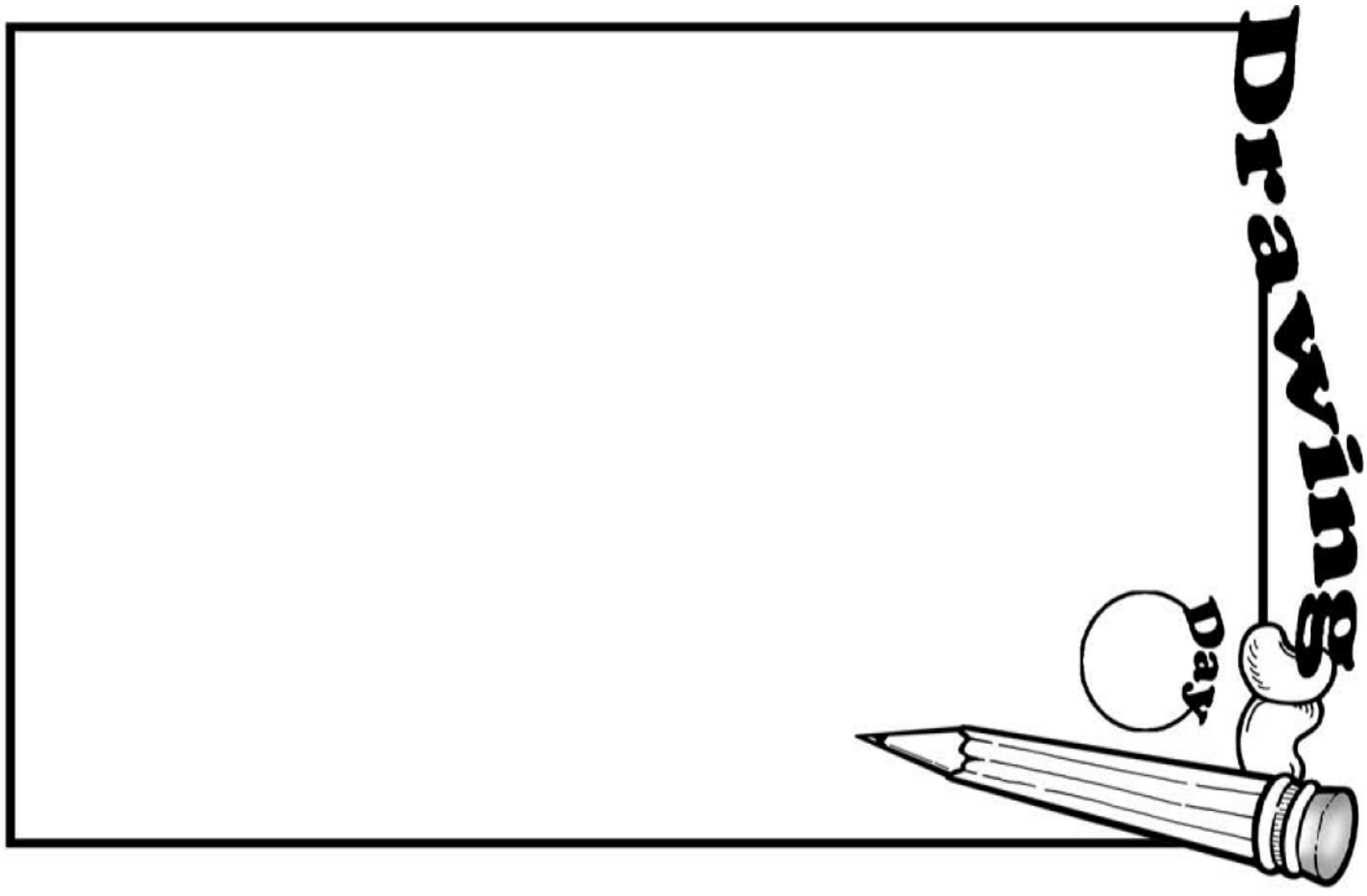
What do seeds Need?

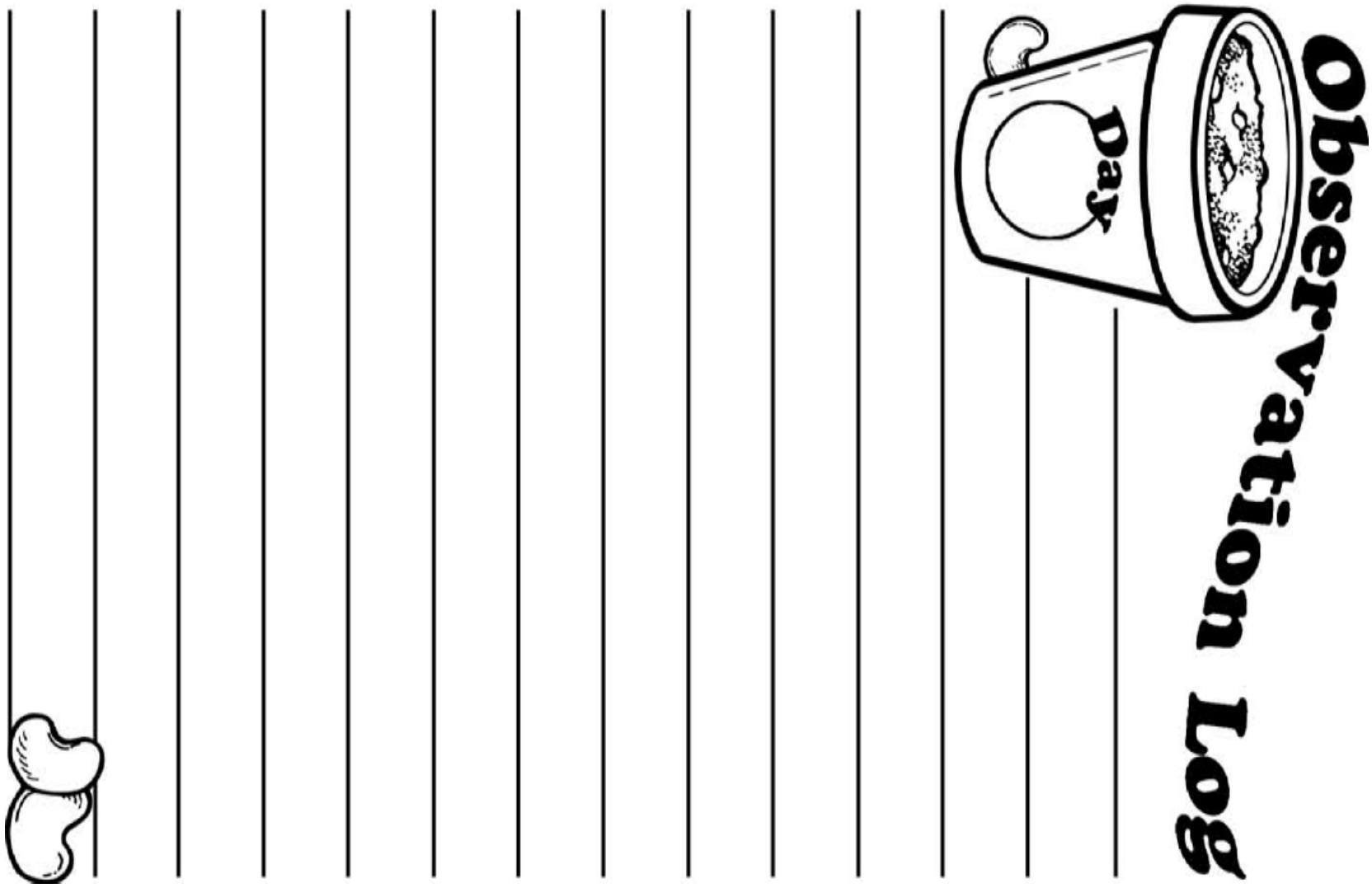






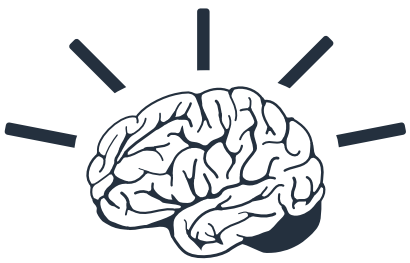
A Plant Begins





Lesson Five

Parts of a Plant



BRAIN BREAKS!

1. Seed Planter Students will squat down to dig a hole, stand up, squat down to plant the seed then stand up, squat down to cover the seed, squat down and water the seed.

2. Fruit/Veggie Talk Teacher will give class a color and students turn to a partner taking turns going back and forth naming a vegetable or fruit of that color, Partner "A" starts. Repeat until partners can no longer name fruits or vegetables of that color.

3. Apple Picker Students reach above their heads, alternating arms to pretend to pick apples from the apple tree. Teacher can time students for 10 sec. – 1 min asking students to count the number of apples they pick.

4. Syllable Snacks Students will work with a partner. Partner "A" will name a garden snack. Partner "B" will have to identify how many syllables are in the name of the snack. Students will repeat switching roles. Play as many rounds as possible in a given time frame.

5. Plant "Party" Students stand up pretending to be a plant. Teacher calls out part of plant (roots-feet, stem-legs, leaves-body, flowers-head). Students touch that part of body where that part of the plant would be located.

6. The Harvester Students bend down and pick a crop, stand up to bundle it, then throw it over their shoulder. Repeat for as many rounds as possible in given time frame.

7. The Watering Can Students stand up and alternately move their hands across their bodies pretending to water their plants.

8. Insect Cycle Students will act out the life cycle of an insect. Egg- student is curled up on floor, Pupa- students crawl around, Larva- students stand up straight and still, Adult- students flap wings and fly.

9. Freeze Students walk/dance around room as teacher calls out vegetable names. Students have to freeze when teacher calls out a fruit.

10. Corn Shuffle Students bend down to pick the corn, then stand up to shuck the corn, eat the corn, then throw it over their shoulder into compost pile.

11. Earthworm Students lay on floor and do the earthworm shuffle by wiggling on the floor.

12. 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). Go back and forth repeating chant as long as desired.

13. Insect Talk Students will turn to a partner taking turns going back and forth naming a garden insect. Repeat until partners can no longer name insects.

OVERVIEW

Students will be able to understand that plants have different parts for different functions.

OBJECTIVE

- Students will identify and label the parts of a plant.
- Students will observe plant growth and record findings in a scientific journal.

STANDARD

Next Generation Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

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

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

- Part 1 - roots, leaves
- Part 2 - leaves, flower
- Part 3 - flower, fruit
- Part 4 - fruit, seed

TIME

2 days, 20-30 minutes each

TEACHER INFORMATION

All plants basically have the same parts to grow; however, these parts may look different in different plants. For example, the roots of a tree looks quite different from a carrot, which is a root. Just as the fruit (seed covering) from plants look entirely different (apple vs. walnut). Another case in point is the difference between the trunk of a tree and the stalk of celery. Both of these are examples of plant stems even though they look very different; they provide the same function to the plant. The edible parts of broccoli are actually groups of flower buds bunched together. In order to identify the parts of plants, one must identify the parts by their function for the plant, not necessarily by how they look.

As with humans, plants have many parts that work in unison for the overall health of the plant. **The root** of a plant has 3 jobs: it anchors the plant in the soil, it carries water and nutrients to the plant, and it stores excess food for the plant. **The stem** of a plant supports the plant above ground and carries water and food (nutrients) to other parts of the plant. Think of the stem as the pipeline of the plant. **The leaves** of the plant are where the food for the overall plant is manufactured using chlorophyll, sunlight, water and air to make food (this process is called photosynthesis). Think of the leaves as the solar panels of the plant. The leaves are also where transpiration (gas exchange) occurs.

The ower of a plant is where the seeds are made. Plants that rely on pollination to reproduce create inviting flowers (size, shape, color, scent) to ensure they are pollinated. **The fruit** of the plant holds the seed(s). **The seeds** are the reproductive part of the plant. Many animals eat seeds in order to survive.

QUESTIONS

- How do plants use roots, leaves, flowers, fruits, and seeds to survive, grow and meet their needs?
- How is a bean seedling like a mature bean plant? How is a bean seedling different from a mature bean plant?
- Why are seeds inside a fruit?
- How do roots help provide nutrients for a plant?
- How does the shape of a leaf help a plant grow?

MATERIALS

- Seedlings from Lesson 4
- Science Journals
- Vocabulary words on sentence strips (*roots, leaves, flower, fruit, seed*)
- *From Seed to Plant* by Gail Gibbons
- Life Cycle of a Seed graphic organizer
- Compare and Contrast worksheets

PROCEDURE

1. Teacher will demonstrate how to record observations of plant growth in a scientific journal using illustrations and words. Use the sample template included or make your own. The key is to guide students to think about change over a period of time by observing characteristics such as color, number of leaves, height of plant, level of moisture in soil, etc. This observation and

recording in the scientific journal should happen daily until this lesson is over or however long the seeds are thriving in the cups indoors.

2. Introduce the vocabulary words "roots" and "leaves" on sentence strips. Display on a science bulletin board or somewhere prominent in the classroom.
3. Teacher will model labeling illustration of seedling in a scientific journal with vocabulary the words "roots" and "leaves." Teacher may have to remind students to think about the bean seeds started in the plastic bags when determining where the roots are located.
4. Read *From Seed to Plant* by Gail Gibbons.
5. Display pages 22-25 in *From Seed to Plant* as a visual reminder of the stages of a plant cycle.
6. Distribute copies of the Life Cycle of a Seed graphic organizer. Label each circle, starting at the top and moving clockwise, with the name of each stage of the plant cycle (*sprout, seedling, young plant, mature plant*). Be sure to emphasize that the main difference between a *young plant* and a mature plant is that a *mature plant* has flowers ready for pollination.
7. Have students complete the graphic organizer by illustrating each step in the plant's life cycle. Ask students to think about where their individual seedling is currently in the plant life cycle.

It is recommended to split the following procedures into 3 separate days. See Grade 1 Lesson 5 Map for suggested timeline.

8. Introduce vocabulary words "leaves, flowers, fruit, and seed" on sentence strips and guide student to label illustrations in scientific journal if applicable.
9. Take students out to the Outdoor Garden Classroom. Allow students 1-2 minutes of free observation time.
10. Guide students to begin looking for leaves, flowers, fruits and seeds. As a class, collect two samples each of leaves, flowers, fruits, and seeds. On a large posterboard with a Venn Diagram, tape or mount the samples and guide students to come up with at least two words each to describe similarities and differences between the two samples.
11. Give students time to illustrate the samples and copy the descriptive words on their own Venn Diagram sheets or in their scientific journals.

ASSESSMENT

- Using a rubric, assess daily entries in the scientific journals for accurate illustrations and proper labeling of vocabulary words.
- Life Cycle of a Plant graphic organizer
- Compare and Contrast worksheets

ADAPTATION

- Read Tops and Bottoms to help struggling students with where parts of a plant belong by generalizing locations.
- Grow seeds in different mediums like a variety of soils, sponges, or hydroponics systems.
- Grow seeds under different levels of light using paper tents or taping paper to leaves.

DIGGING DEEPER

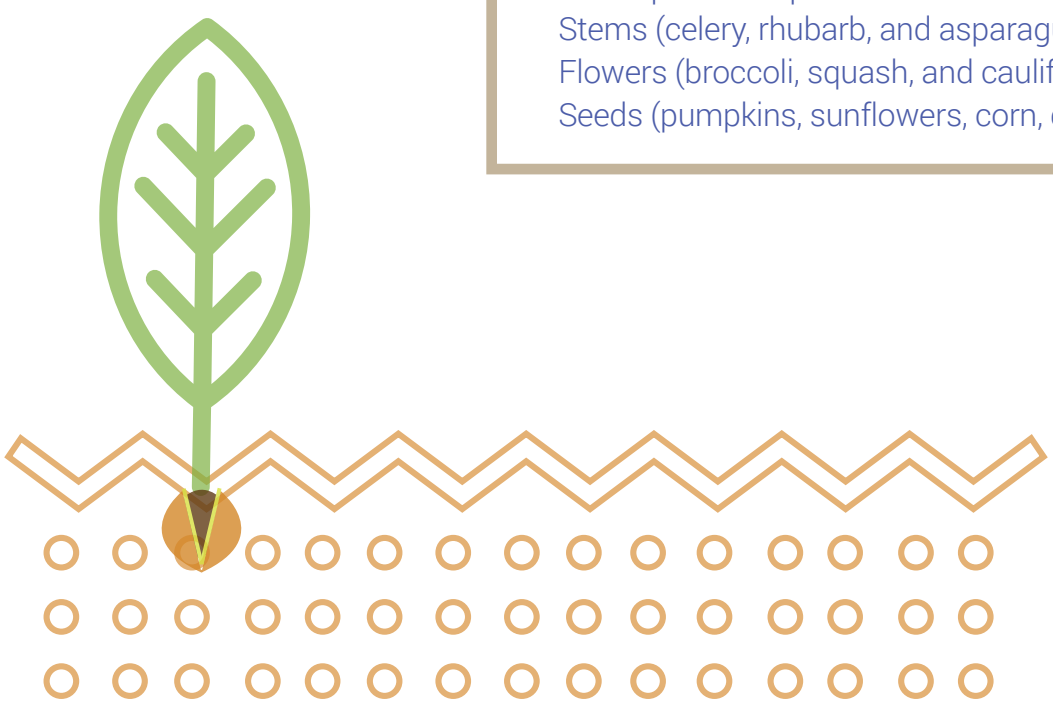
- Try using a non-traditional measurement tool such as the kids' feet, thumbs, or fingers.

DID YOU KNOW?

- Grey and silver coloration of plants is generally the result of a layer of white hairs on the leaf surface, which reduces water loss by reflecting the sun's rays and which hold the moisture close to the leaf surface and thus helps keep the tissues cool.
- Some flowers bloom at night to attract nocturnal pollinators such as bats.
- Jack rabbits have large ears to keep them cool in the desert heat.

NUTRITION FACTS

- All the parts of a plant can be edible in some way: Roots (potatoes, carrots, beets, and radishes), Stems (celery, rhubarb, and asparagus), Leaves (spinach, lettuce, kale, cabbage, and cilantro), Flowers (broccoli, squash, and cauliflower), Fruits (strawberries, blueberries, and apples) and Seeds (pumpkins, sunflowers, corn, green beans, and peas).



LESSON MAP

Next Generation Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

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

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

ELA

- **Reading**
  - RI.1.1 Ask and answer questions about key details in a text.
  - RI.1.2 Identify the main topic and retell key details of a text.
  - RI.1.10 With prompting and support, read informational texts appropriately complex for grade.
- **Writing**
  - W.1.7 Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions).
  - W.1.8 With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

Math

1.NBT.B3 Compare two, two-digit numbers based on meanings of the tens and ones digts, recording the results of comparisons with the symbols >, =, and <.

1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properites of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

1.NBT.C.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range of 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

MP.2 Reason abstractly and quantitatively.

MP.5 Use appropriate tools strategically.

1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

Lesson 5: Parts of the Plant

Day 1

- Record observations of plant growth in soil. Illustrate what they see in Seed Observation Journal.
- Introduce vocabulary (*roots, leaves*)
- Label illustrations with vocabulary words.

Day 2

- Record observations of plant growth in soil. Illustrate what they see in Seed Observation Journal.
- Review Day 1 diagrams and vocabulary.
- Read *From Seed to Plant* by Gail Gibbons
- Students will retell story with Life Cycle of a Seed GO (included in this lesson)

Day 3

- Record observations of plant growth in soil. Illustrate what they see in Seed Observation Journal.
- Introduce vocabulary (*leaves, flower*).
- Identify leaves and flowers on plants in the OC.
- Compare and Contrast 2 different leaves and flowers identified in the garden. (included in this lesson)

Day 4

- Record observations of plant growth in soil. Illustrate what they see.
- Introduce vocabulary (*flower, fruit*) and label illustrations if applicable.
- Identify flowers and fruits on plants in the OC.
- Compare and Contrast 2 different flowers and fruits identified in the garden. (included in this lesson)

Day 5

- Record observations of plant growth in soil. Illustrate what they see.
- Introduce vocabulary (fruit, seed) and label illustrations if applicable.
- Identify fruits and seeds on plants in OC.
- Compare and Contrast 2 different fruits and seeds identified in the garden. (included in this lesson)

Day(s) 5
Math Compare lengths and sizes of fruits and seeds

Day(s) 1

Literacy connection
From Seed to Plant by Gail Gibbons

Life Cycle of a Seed
Graphic Organizer

Day(s) 3

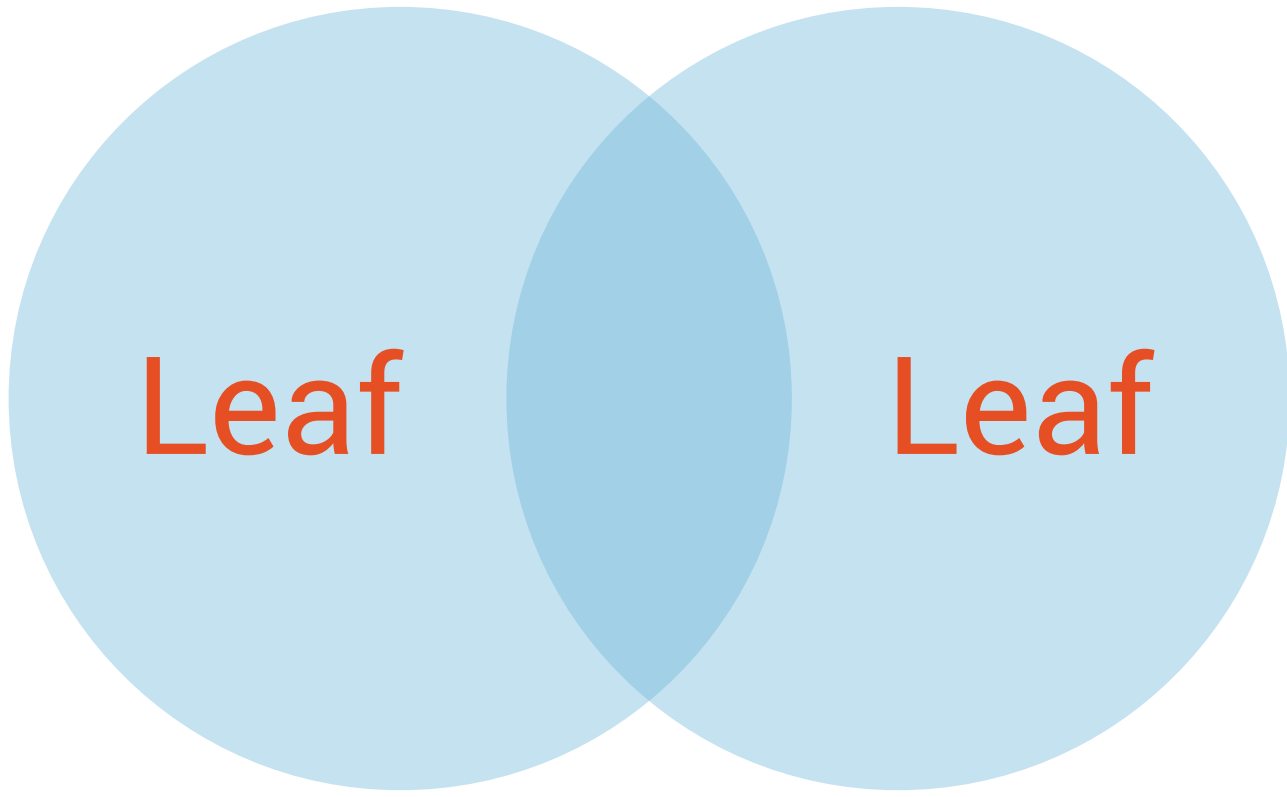
Science/Social Studies Extension
Compare leaves on native desert plants around your school to the leaves on plants growing in your garden. Describe the shape, size, and color. What could be a reason why they are different?

Name:_____

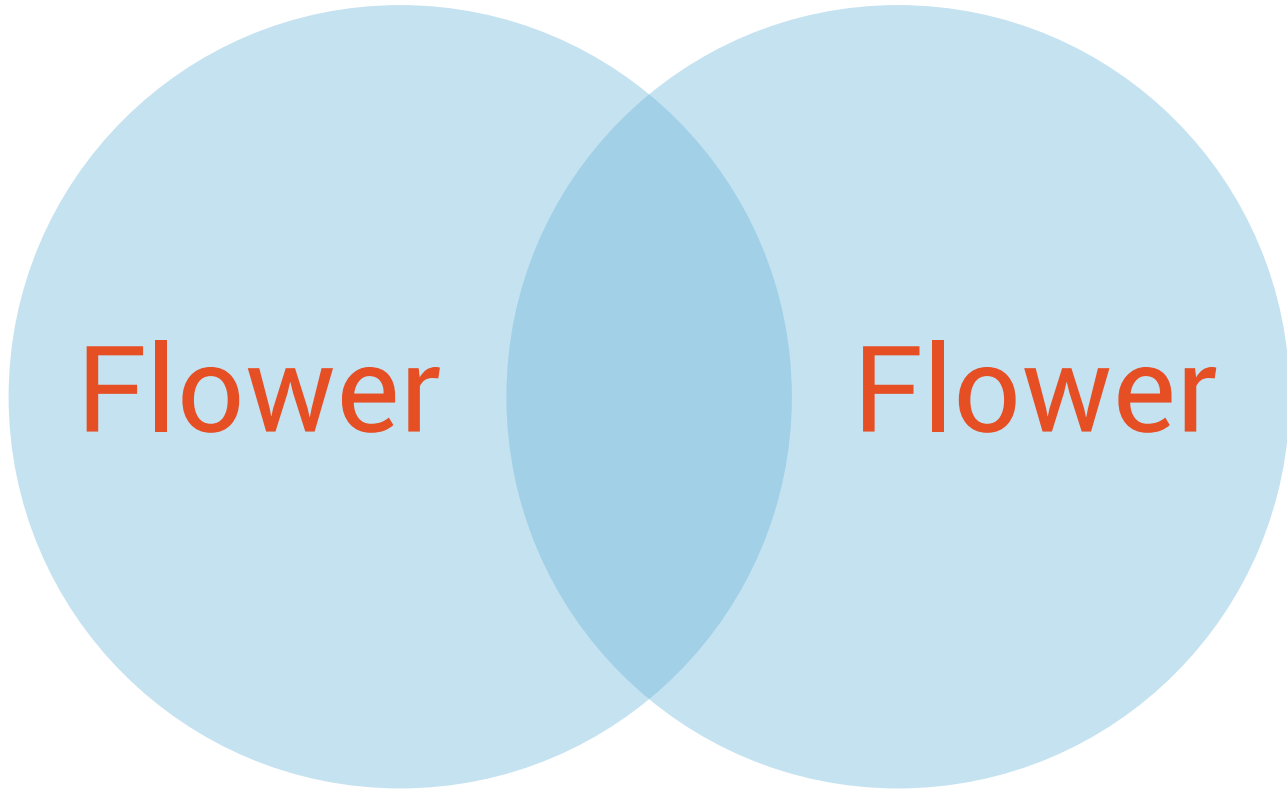
Date: _____

LEAVES AND FLOWERS

Find two different kinds of leaves in your school garden and tape them in the Venn Diagram below.
Write at least 2 words to describe what they have in common and what makes them different.



Find two different kinds of flowers in your school garden and tape them in the Venn Diagram below.
Write at least 2 words to describe what they have in common and what makes them different.

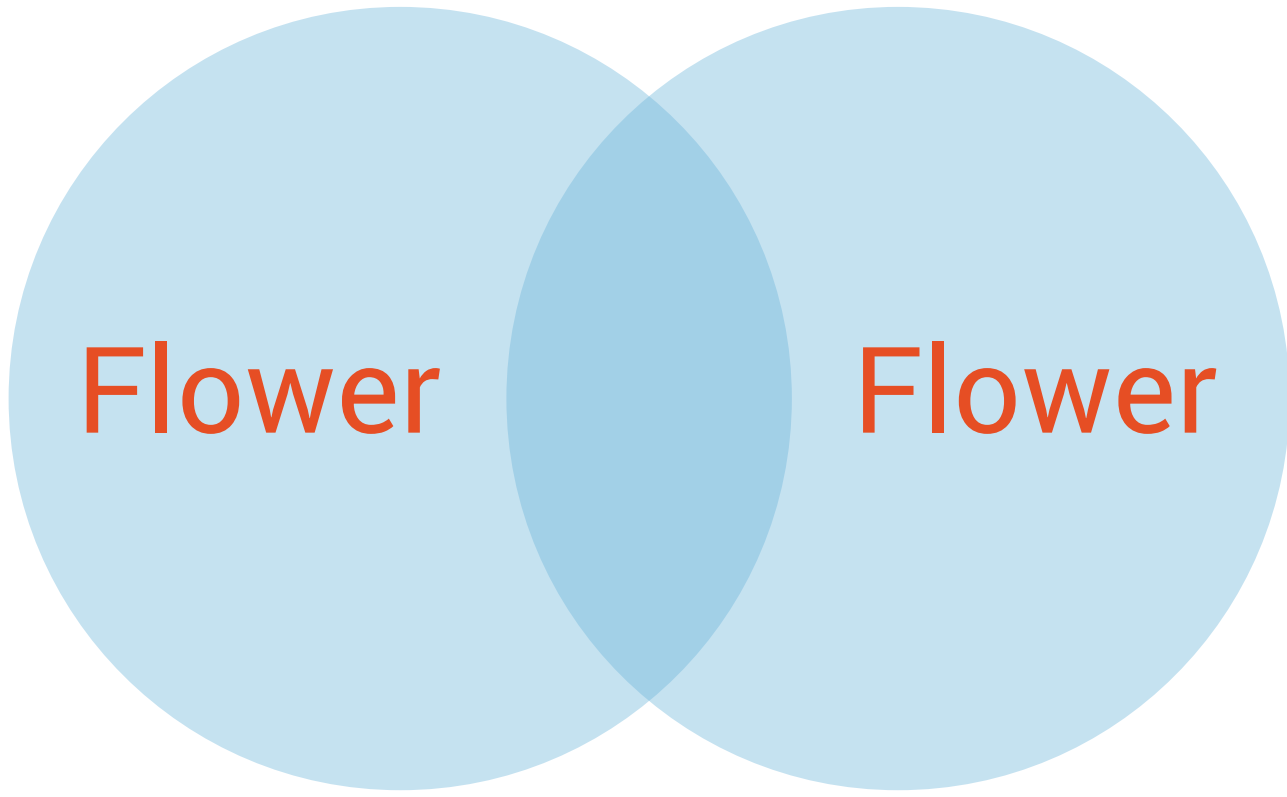


Name:_____

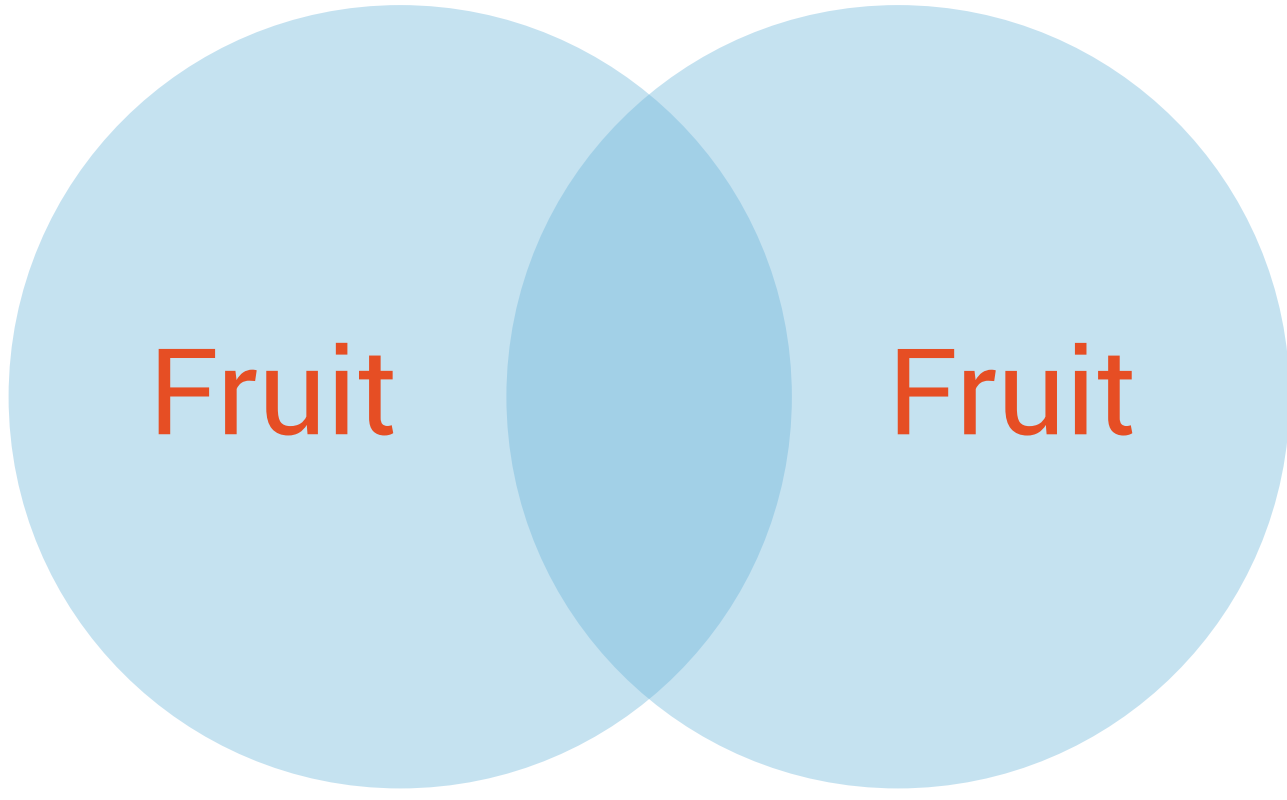
Date: _____

FLOWERS AND FRUITS

Find two different kinds of flowers in your school garden and tape them in the Venn Diagram below. Write at least 2 words to describe what they have in common and what makes them different.



Find two different kinds of fruits in your school garden and draw a picture in the Venn Diagram below. Write at least 2 words to describe what they have in common and what makes them different.

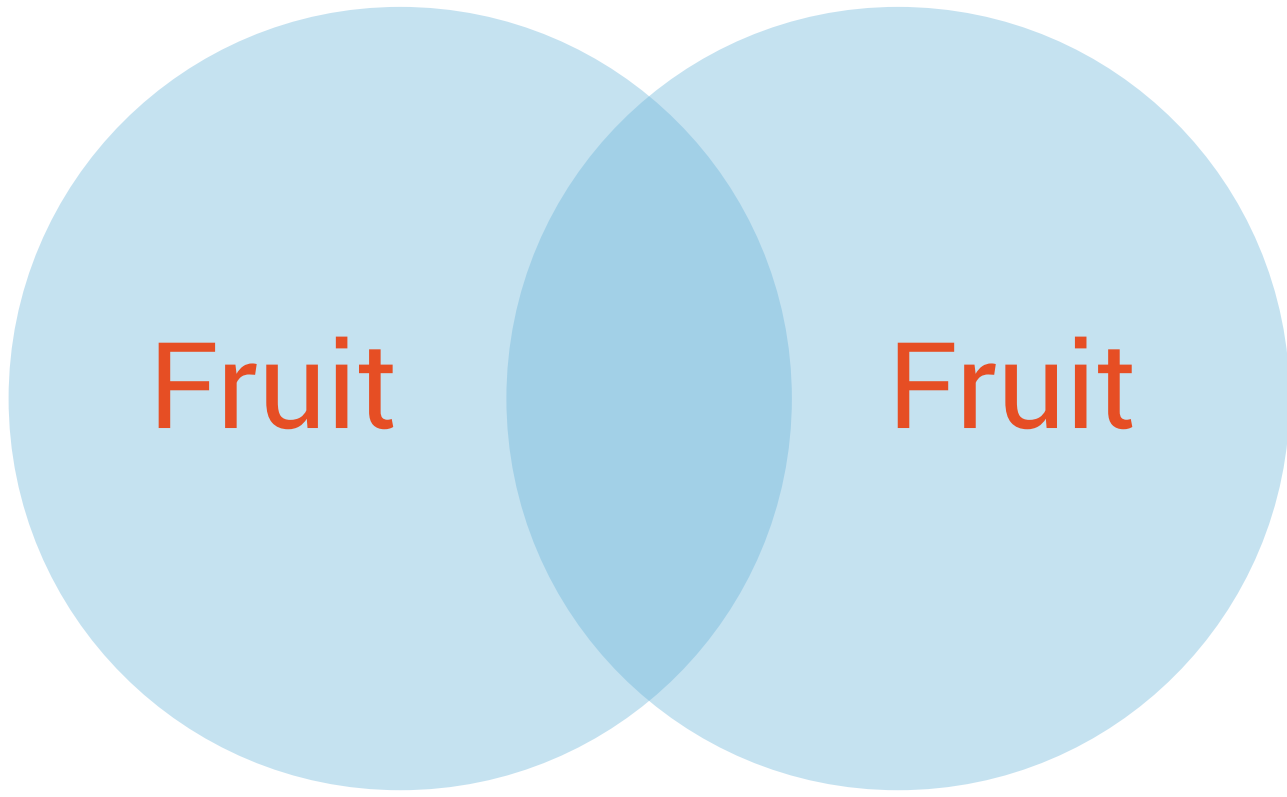


Name:_____

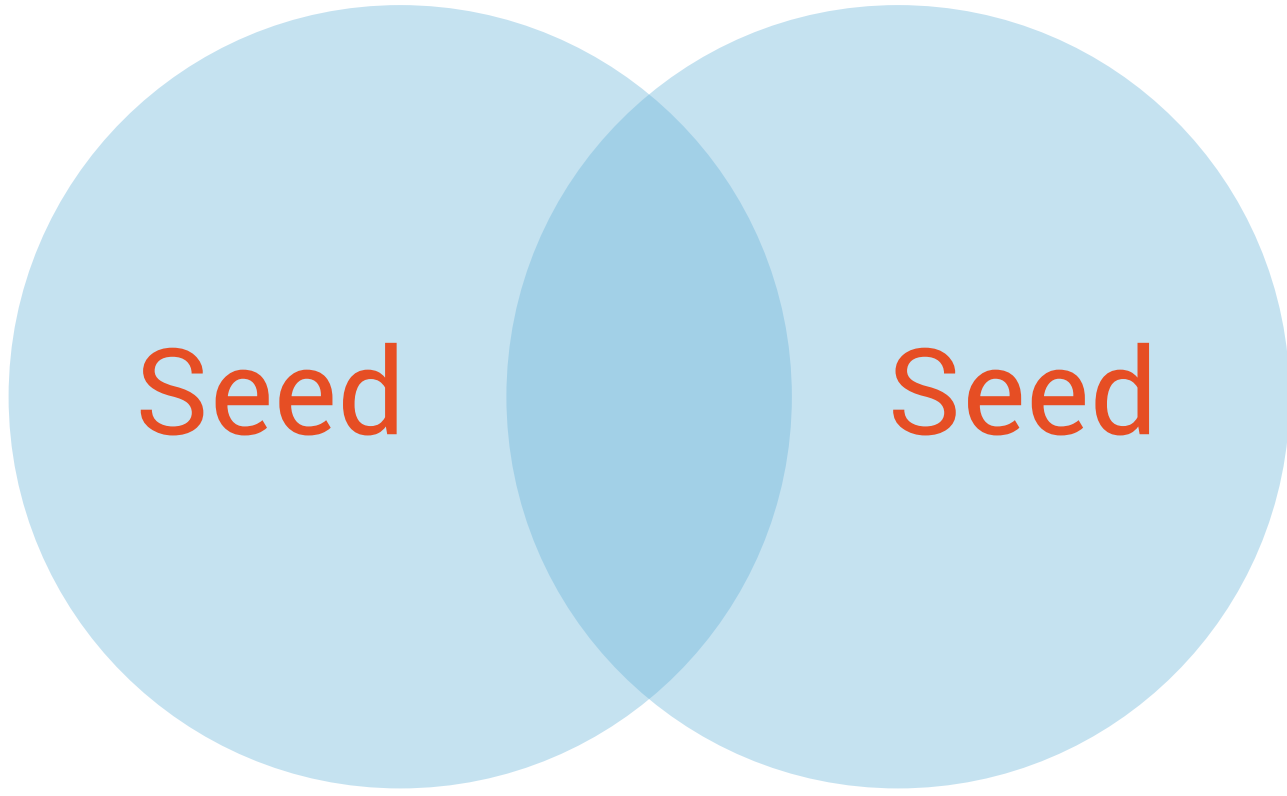
Date: _____

FRUITS AND SEEDS

Find two different kinds of fruits in your school garden and draw them in the Venn Diagram below. Write at least 2 words to describe what they have in common and what makes them different.



Find two different kinds of seeds in your school garden and draw a picture in the Venn Diagram below. Write at least 2 words to describe what they have in common and what makes them different.



Name:_____

Date: _____

HOW LONG? HOW BIG?

1. Measure the length of any two plants growing in your garden. Make sure to label each with their name and draw a picture. Include your measurement in the box!

Which plant is longer? _____

2. Measure two seeds from the same plant. Make sure to label which plant it came from and draw a picture. Include your measurement in the box!

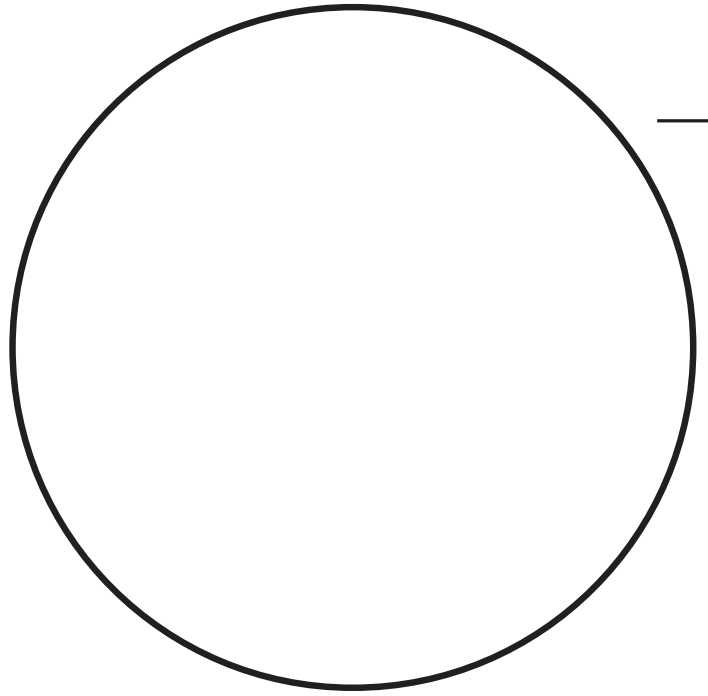
Which plant is longer? _____

Name _____ Date _____

Life Cycle of the:

Write the name of each stage in the life cycle of the following animal (or plant) and then draw an example of it in the circle nearest the name (start the cycle in the top, middle circle).

_____



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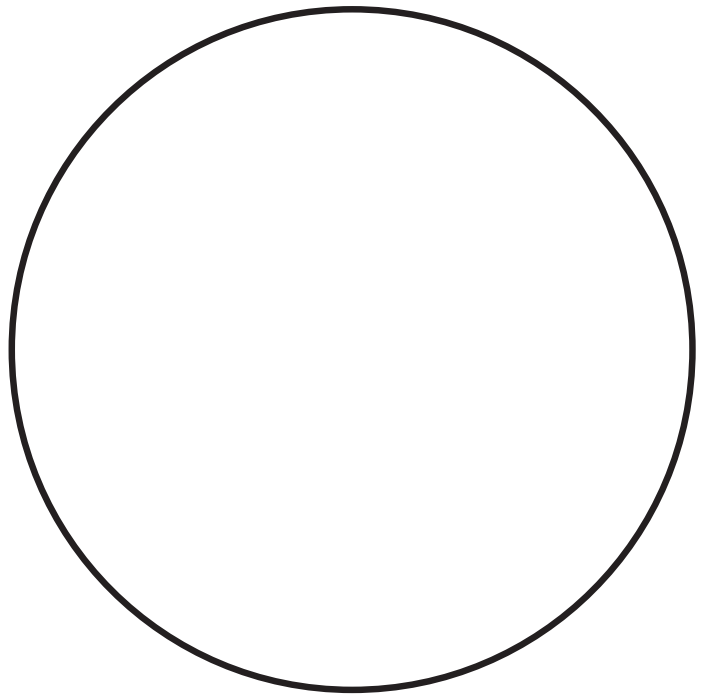

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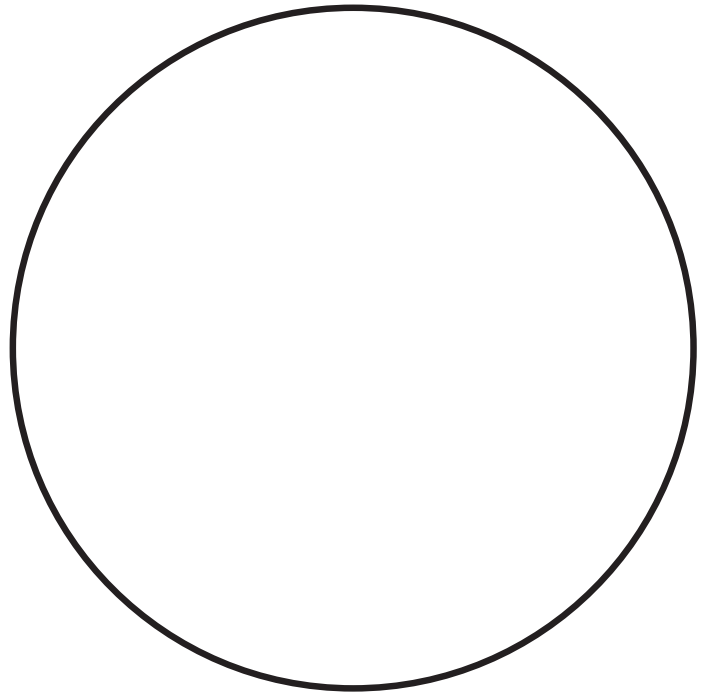

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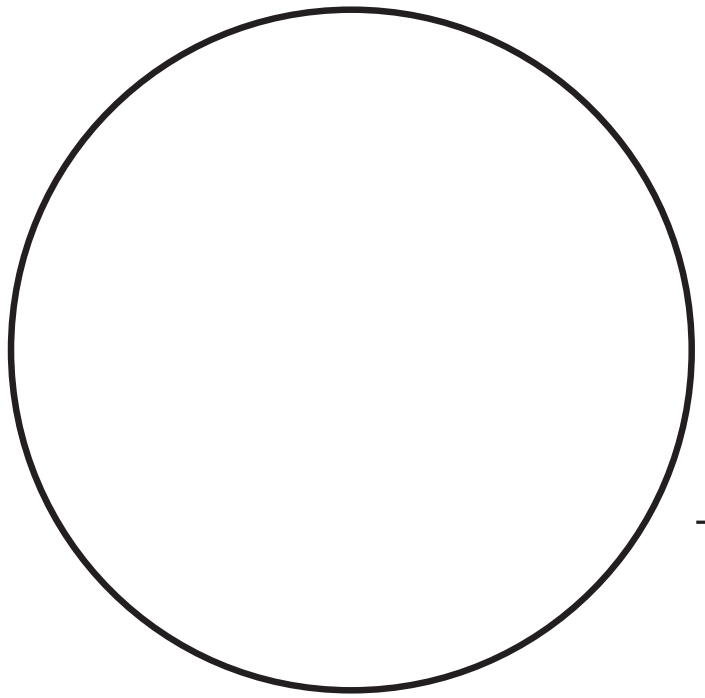


Growth of a Seed Journal

Name

This is the seed I planted.

This is my seed after _____ days.

This is my seed after _____ days.

This is my seed after _____ days.

This is my seed after _____ days.

This is my seed after _____ days.	**This is my seed after _____ days.**
This is my seed after _____ days.	**This is my seed after _____ days.**

RUBRIC FOR GROWTH OF A SEED JOURNAL

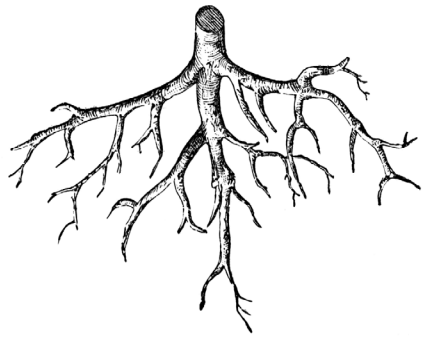
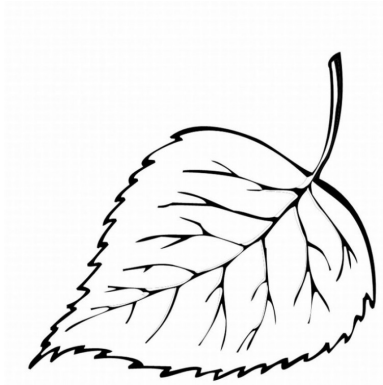
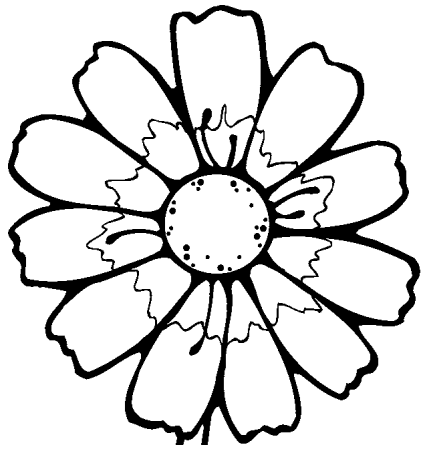
Students should show the following on each page of their Seed Growth Journal.

- Name on the cover of the Journal.
- Number of day of the seed growth on each page.
- Picture of the seed as it appears for each entry.
- Label the picture on each entry.
    - Example:
        - Soil
        - Seed
        - Root
        - First leaves
        - Stem
        - True leaves

    Vocabulary for the various parts can be added to the journal:

    - Emerge to come into view
        - Synonyms appear, arrive, show, rise, materialize, spring forth
    - Root or Radicle
    - Stem
    - Cotyledons primary leaf of the embryo of seed plants.
    - True Leaves emerges from the cotyledons
    - Plant

Parts of a Plant Graph

Roots	Stem	Leaf	Flower
			

Color in one rectangle for every item you see in the garden. Example: If you see one flower, color 1 rectangle on your graph.

EXTENSION FOR PARTS OF A PLANT LESSON

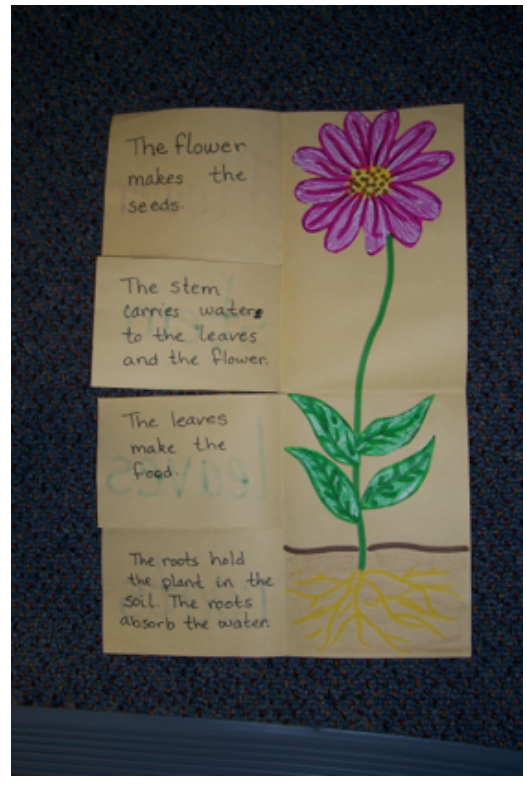
Students will show their understanding of the different parts and functions they perform for the plant by creating a flip-book.

MATERIALS

- Large sheet of construction paper
- Scissors
- Markers/Crayons/Colored Pencils
- Pencil

PROCEDURE

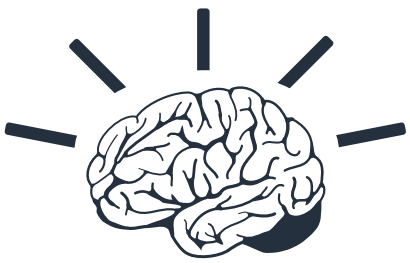
1. Students fold the construction paper in half lengthwise.
2. Students will then fold the paper into fourths.
3. Students cut on the fold to the center of the page. There will be 3 cuts. See photos below.
4. With the paper folded, add the words: flower, stem, leaves, roots. (See example).
5. Open the 'pages' up. On the left side, write the function of the named part. On the right side of the page, draw a picture of the plant part.



For more foldable book ideas:
http://www.realclassroomideas.com/resources/Foldables-+How+to+Fold.pdf

Lesson Six

Collecting Seeds



BRAIN BREAKS!

1. Seed Planter Students will squat down to dig a hole, stand up, squat down to plant the seed then stand up, squat down to cover the seed, squat down and water the seed.

2. Fruit/Veggie Talk Teacher will give class a color and students turn to a partner taking turns going back and forth naming a vegetable or fruit of that color, Partner "A" starts. Repeat until partners can no longer name fruits or vegetables of that color.

3. Apple Picker Students reach above their heads, alternating arms to pretend to pick apples from the apple tree. Teacher can time students for 10 sec. – 1 min asking students to count the number of apples they pick.

4. Syllable Snacks Students will work with a partner. Partner "A" will name a garden snack. Partner "B" will have to identify how many syllables are in the name of the snack. Students will repeat switching roles. Play as many rounds as possible in a given time frame.

5. Plant "Party" Students stand up, pretending to be a plant. Teacher calls out part of plant (roots-feet, stem-legs, leaves-body, flowers-head). Students touch that part of body where that part of the plant would be located.

6. The Harvester Students bend down and pick a crop, stand up to bundle it, then throw it over their shoulder. Repeat for as many rounds as possible in given time frame.

7. The Watering Can Students stand up and alternately move their hands across their bodies pretending to water their plants.

8. Insect Cycle Students will act out the life cycle of an insect. Egg- student is curled up on floor, Pupa- students crawl around, Larva- students stand up straight and still, Adult- students flap wings and fly.

9. Freeze Students walk/dance around room as teacher calls out vegetable names. Students have to freeze when teacher calls out a fruit.

10. Corn Shuffle Students bend down to pick the corn, then stand up to shuck the corn, eat the corn, then throw it over their shoulder into compost pile.

11. Earthworm Students lay on floor and do the earthworm shuffle by wiggling on the floor.

12. 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). Go back and forth repeating chant as long as desired.

13. Insect Talk Students will turn to a partner taking turns going back and forth naming a garden insect. Repeat until partners can no longer name insects.

OVERVIEW

Students will be able to understand that plants produce seeds for regeneration.

OBJECTIVE

- Students will sort seeds and self-determine categories.
- Students will compare number of seeds in types of fruit.
- Students will be able to identify seeds on a variety of plants.

STANDARD

Next Generation Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

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

TIME

3 days, 20-30 minutes each *(Plan lesson when seeds are available to harvest in the Outdoor Garden Classroom)*

TEACHER INFORMATION

Information quoted from International Seed Saving Institute: (http://www.seedsave.org/issi/904/beginner.html)

Bean, Lettuce, Pea, Pepper, Tomato.

These vegetables offer the beginning seed saver the best chance for successful seed saving. They produce seeds the same season as planted and are mostly self-pollinating, minimizing the need to be mindful of preventing cross-pollination.

Bean: Allow pods to dry brown before harvesting, about six weeks after eating stage. If frost threatens, pull entire plant, root first, and hang in a cool, dry location until pods are brown.

Lettuce: Some outside leaves can be harvested for eating without harming seed production. Allow seed heads to dry 2-3 weeks after flowering. Individual heads will ripen at different times, making the harvest of large amounts of seed at one time nearly impossible. Wait until half the flowers on each plant have gone to seed. Cut entire top of plant and allow to dry upside down in an open paper bag.

Peas: Allow pods to dry brown before harvesting, about four weeks after eating stage. If frost threatens, pull entire plant, root first, and hang in cool, dry location until pods are brown.

Pepper: Harvest mature, fully-ripe peppers for seed. (Most bell peppers turn red when fully mature.) If frost threatens before peppers mature, pull entire plant and hang in cool, dry location until peppers mature.

Tomato: If possible, allow tomatoes to completely ripen before harvesting for seed production. Unripe fruits, saved from the first frost, will ripen slowly if kept in a cool, dry location. Seeds from green, unripe fruits will be most viable if extracted after allowing the fruits to turn color.

QUESTIONS

- How did your great-grandparents find seeds to plant their gardens?
- When do you harvest seeds in the plant life cycle?

MATERIALS

- Lesson 4 vocabulary on sentence strips
- An example plant in the school garden

PROCEDURE

- Day One

1. Review vocabulary from Lesson 4 – Parts of a Plant by directing students to identify the parts of the plant in the school garden.

2. Teacher will prompt students to discuss what they know about the beginning stages of a plant's life. What do most plants come from? *Seeds.*

3. Teacher will guide students to identify seeds on plants in the school garden. Encourage them to think about where seeds could be if they are not visible to the eye.

4. Teacher will explain to students that they will learn how to collect seeds from common fruits and vegetables.

5. Teacher will distribute a paper plate and popsicle stick to each student. Divide students into 4 groups. Each group will get a pre-cut fruit or vegetable (apples, oranges, cucumbers, bell peppers) with seeds exposed. *Make sure all groups, but especially the bell pepper group, know not to touch their face and eyes when handling the fruits and seeds.

6. Teacher will model how to use the popsicle stick to separate seeds from the fruit.

7. Students will work in groups to separate seeds from fruits.

8. Teacher will model how to record the number of seeds found in the fruit on the chart included in the mapping.

- Day Two

1. Using the same grouping as yesterday, allow students time to explore the school garden in search of a plant with seeds ready for harvest. You may want to identify these ahead of time so you know what they are and how to harvest them (see teacher info above).

2. Allow students time to draw the plants in their journals, using realistic scientific drawings depicting the mature plant, fruits, and seeds.

3. Roam amongst the groups as they draw in their journals and prompt students to discuss how they would harvest the seeds from their plants. Guide them on how to do so properly.

4. Allow students to harvest 1 seed from their plant to attach to their journals with tape. Students should label the seed.

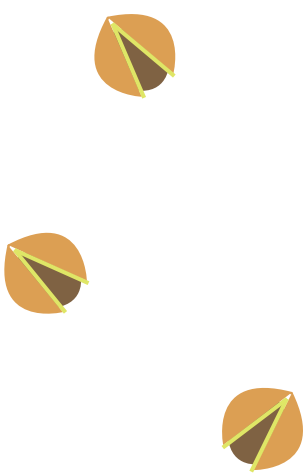
ASSESSMENT

- Student Evidence Sheets included in Mapping

ADAPTATION

- Explore how to save seeds in greater detail, specific to the varieties growing in your school garden. Determine how best to store, organize, and plan to harvest seeds. How could the seeds be shared? What kind of packaging should be used?

- Instead of separating seed from four different types of fruits, explore seeds in the same fruit or vegetable like beans or pea pods.



DID YOU KNOW?

- Inside of seeds are plenty of nutrients for baby plants. This is why seeds, such as sunflower seeds, are good for us to eat as well.

GARDENER TIPS

- Coordinate tasting seeds in late August or late fall when sunflowers, beans, peas or pumpkins will be ready.

NUTRITION FACTS

- Despite rumors indicating otherwise, most fruit seeds can be eaten in moderate quantities.

LESSON MAP

Next Generation Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

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

ELA

- **Reading**
  - RI.1.1 Ask and answer questions about key details in a text.
  - RI.1.2 Identify the main topic and retell key details of a text.
  - RI.1.10 With prompting and support, read informational texts appropriately complex for grade.
- **Writing**
  - W.1.7 Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions).

Math

1.NBT.B3 Compare two two-digit numbers based on meanings of the tens and ones digts, recording the results of comparisons with the symbols >, =, and <.

1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properites of operations, and/or the relationship between addtion and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

1.NBT.C.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range of 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Lesson 6: Collecting Seeds

**Plan lesson when seeds are available to harvest in the OC*

Day 1

- Review vocabulary from Lesson 4: Parts of a Plant
- Distribute paper plates and popsicle sticks. One fruit/ vegetable per group: apples, oranges, cucumber, bell peppers (*fruits and vegetables should be pre-cut by an adult)
- Students will work in groups to separate seed from fruit.
- Count how many seeds and record on graph (included in this lesson)

Day 2

- Class goes to OGC. Each group identifies a plant with seeds. Students will draw the plant in their journals and harvest one seed to tape in their journals. Students will label their drawing.

Day(s) 1

Math Multiples of 10
Seed Counting

Day(s) 2

Literacy connection
A Fruit is a Suitcase for Seeds

Main idea and details
Graphic Organizer

Day(s) _____

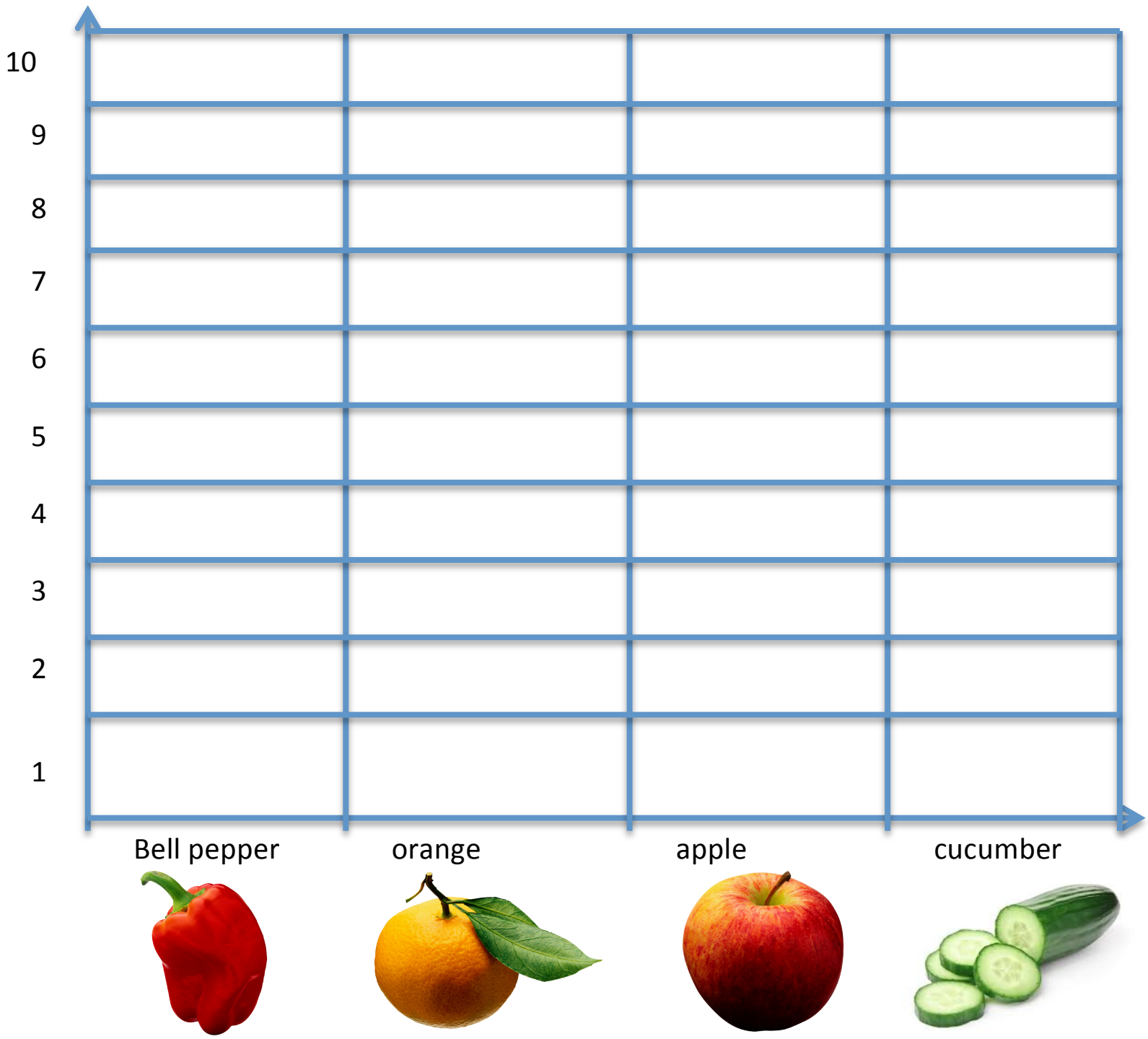
Science/Social Studies Extension
Explore how grandparents and great-grandparents saved seeds for their gardens.

Name:_____

Date: _____

SEEDS IN FRUIT CHART

Color the graph to show how many seeds each group found per vegetable.



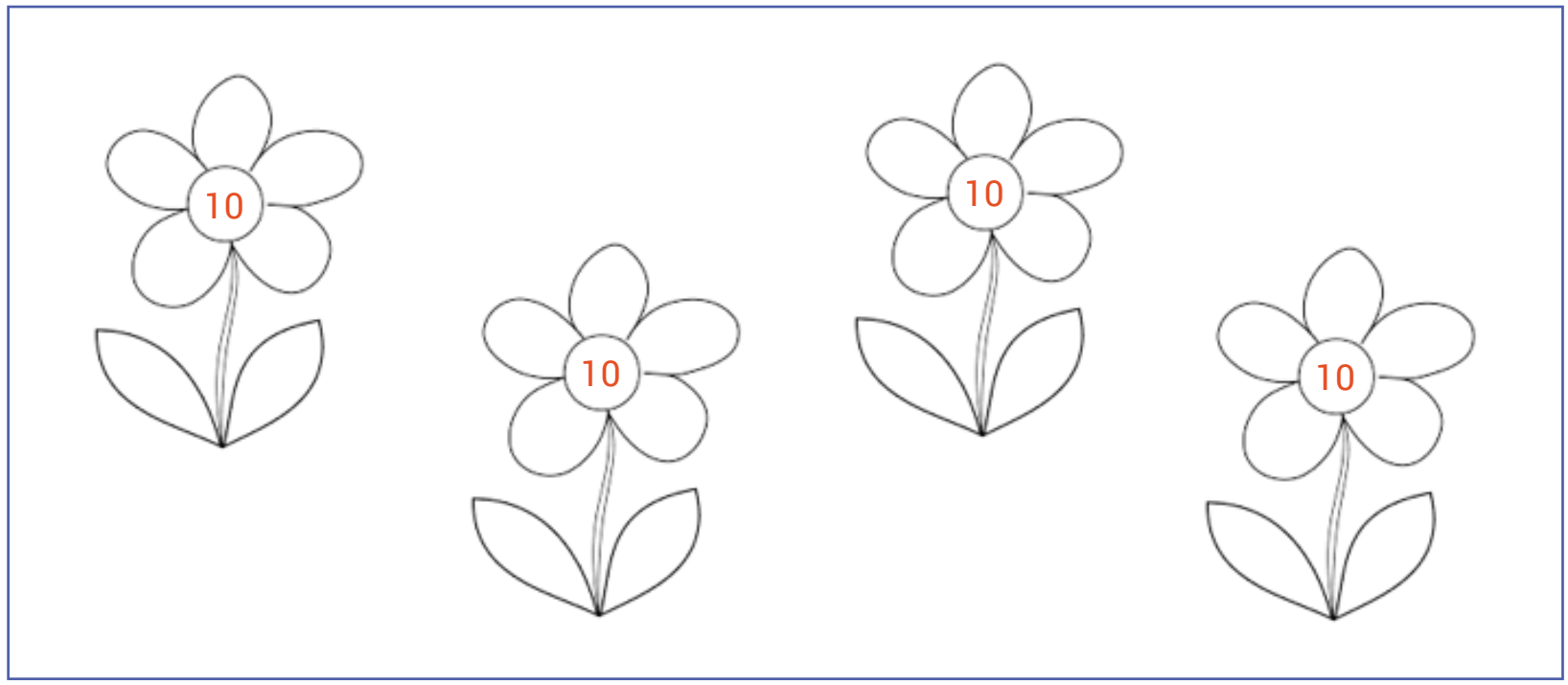
Name:_____

Date: _____

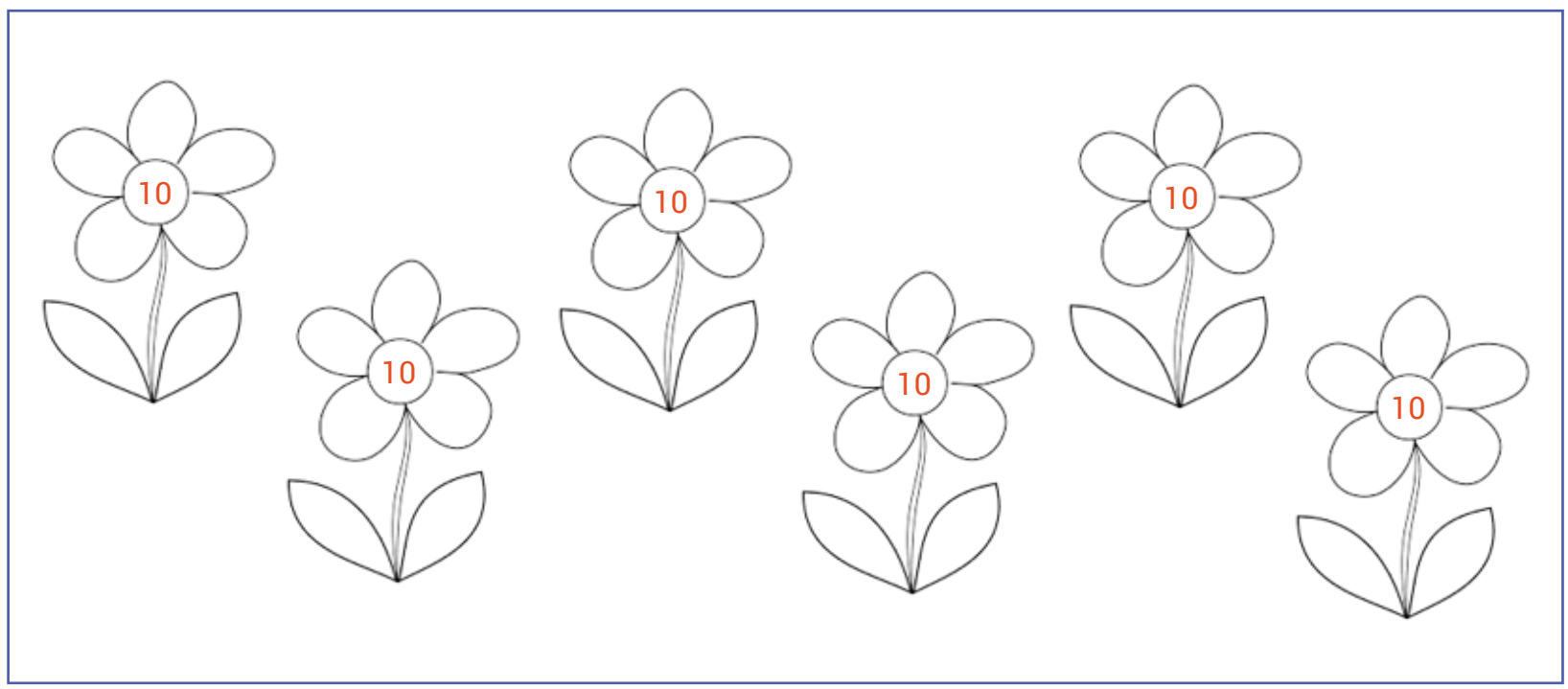
MULTIPLES OF 10

Each flower has 10 seeds in the garden bed below. How many seeds are in each garden bed all together? Count by 10s.

How many seeds are in this garden bed ? _____ seeds



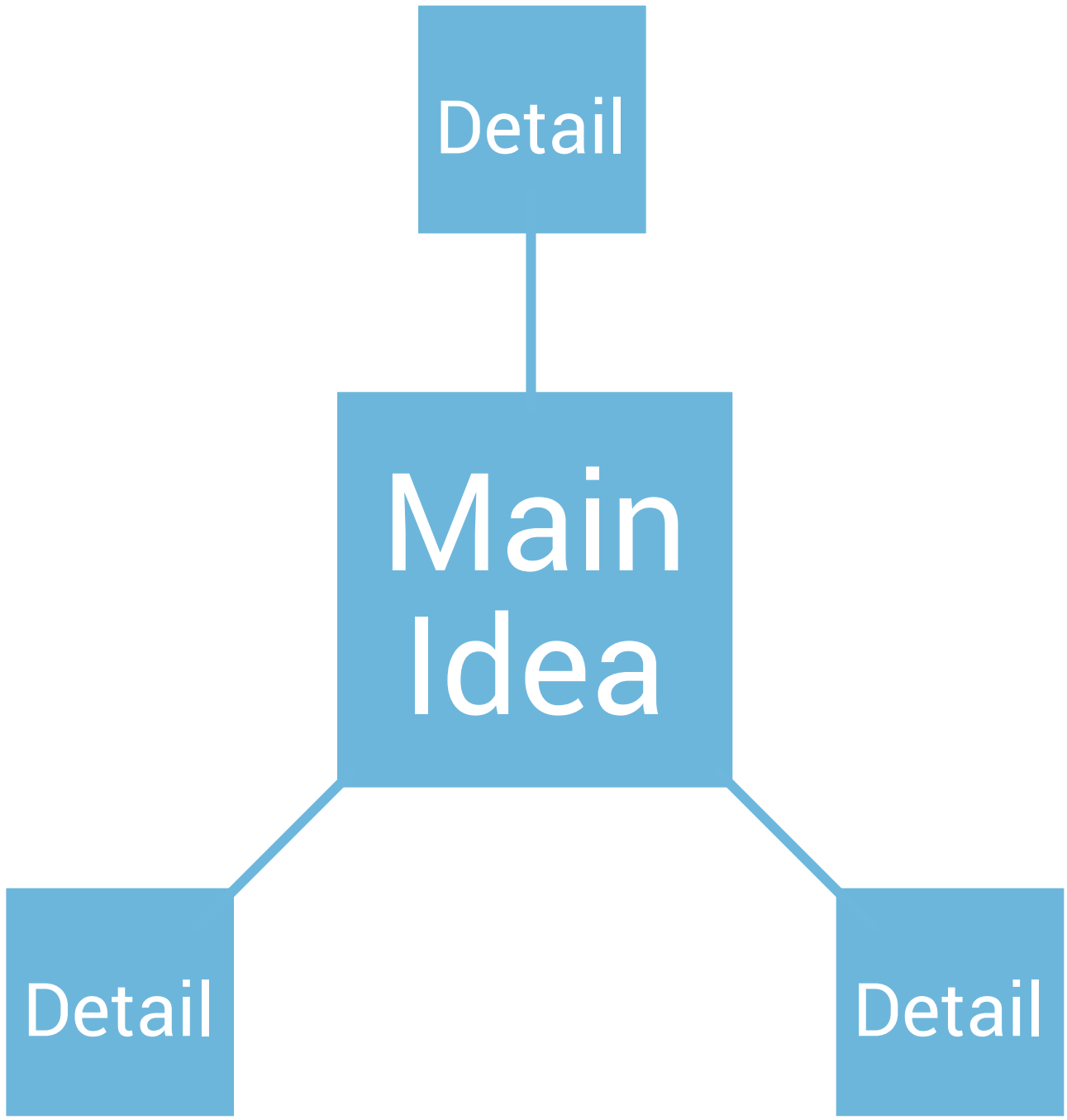
How many seeds are in this garden bed ? _____ seeds



Name:_____

Date: _____

A FRUIT IS A SUITCASE FOR SEEDS



BOOKS

- *Seeds! Seeds! Seeds!* by Wallace, Nancy Elizabeth
- *The Magic School Bus Plants Seeds* by Cole, Joanna
- *The Dandelion Seed* by Anthony, Joseph and Arbo, Cris
- *In a Nutshell* by Anthony, Joseph and Arbo, Cris
- *Pick, Pull, Snap!* by Schaefer, Lola and George, Lindsay
- *Sunflower House* by Bunting, Eve
- *The Gardener* by Small, David
- *The Good Brown Earth* by Henderson, Kathy
- *The Garden of Happiness* by Lambase, Barbara
- *City Garden* by DiSalvo-Ryan, DyAnne
- *The Empty Pot* by Demi
- *A Seed Grows: My First Look at a Plant's Life Cycle* by Pamela Hickman
- *Seeds* by Robbins, Ken

TEACHER RESOURCES

- *Seed to Seed: Saving and Growing Techniques for Vegetable Gardeners* by Ashworth, Suzanne
- *Seed Sowing and Saving* by Turner, Carole
- *The Complete Guide to Saving Seeds* by Gough, Robert E.
- *Saving Seeds: The Gardener's Guide to Growing and Storing Vegetable and Flower Seeds* by Rogers, Marc

WEBSITES

http://www.seedsavers.org/onlinestore/Seed-Collections/

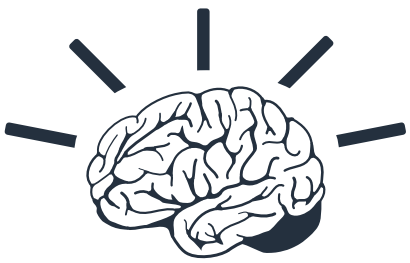
http://www.seedsavers.org/onlinestore/Seed-Collections/Collection-Childrens-Seed.html (Has a 10-page booklet, *"My Garden Has a Story"*)

http://www.wildchicken.com/nature/garden/ga014_collecting_drying_storing_seed.htm

http://www.fs.fed.us/rm/pubs_other/wo_AgricHandbook730/wo_AgricHandbook727_113_131.pdf

Lesson Seven

Sunflower Harvest



BRAIN BREAKS!

1. Seed Planter Students will squat down to dig a hole, stand up, squat down to plant the seed then stand up, squat down to cover the seed, squat down and water the seed.

2. Fruit/Veggie Talk Teacher will give class a color and students turn to a partner taking turns going back and forth naming a vegetable or fruit of that color, Partner "A" starts. Repeat until partners can no longer name fruits or vegetables of that color.

3. Apple Picker Students reach above their heads, alternating arms to pretend to pick apples from the apple tree. Teacher can time students for 10 sec. – 1 min asking students to count the number of apples they pick.

4. Syllable Snacks Students will work with a partner. Partner "A" will name a garden snack. Partner "B" will have to identify how many syllables are in the name of the snack. Students will repeat switching roles. Play as many rounds as possible in a given time frame.

5. Plant "Party" Students stand up pretending to be a plant. Teacher calls out part of plant (roots-feet, stem-legs, leaves-body, flowers-head). Students touch that part of body where that part of the plant would be located.

6. The Harvester Students bend down and pick a crop, stand up to bundle it, then throw it over their shoulder. Repeat for as many rounds as possible in given time frame.

7. The Watering Can Students stand up and alternately move their hands across their bodies pretending to water their plants.

8. Insect Cycle Students will act out the life cycle of an insect. Egg- student is curled up on floor, Pupa- students crawl around, Larva- students stand up straight and still, Adult- students flap wings and fly.

9. Freeze Students walk/dance around room as teacher calls out vegetable names. Students have to freeze when teacher calls out a fruit.

10. Corn Shuffle Students bend down to pick the corn, then stand up to shuck the corn, eat the corn, then throw it over their shoulder into compost pile.

11. Earthworm Students lay on floor and do the earthworm shuffle by wiggling on the floor.

12. 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). Go back and forth repeating chant as long as desired.

13. Insect Talk Students will turn to a partner taking turns going back and forth naming a garden insect. Repeat until partners can no longer name insects.

OVERVIEW

Students will be able to harvest seeds.

OBJECTIVE

- Students will learn how to harvest plant seeds.

STANDARD

Nevada State Standards

(1)1.1 Record observations and explanations using pictures, words and numbers.

(1)1.2 Use equipment to gather information.

(1)4.1 Identify observable characteristics of plants.

Next Generation Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

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

TIME

45-minute session

TEACHER INFORMATION

For this lesson, sunflower seeds will be collected and harvested. The students will also roast some of the seeds for consumption.

Native Americans have been growing, harvesting and eating sunflower seeds for thousands of years. Some archeologists believe that Native Americans grew sunflowers before they started growing corn. They used the sunflowers many different ways: pounded into flour (like we do with wheat these days), eating seeds as a snack (just like we do today) and extracting sunflower oil from the seeds for cooking.

Early Spaniards had never seen sunflowers before arrving in the New World. They did take some of the seeds back to Europe to be used. By the late 1800s, sunflower seeds developed in Russia found their way into the United States and into many seed catalogs.

QUESTIONS

- What does it mean to harvest seeds?

MATERIALS

- Science Journals
- Sunflower Plants
- Paper Bags
- String
- Baking Pans
- Oven
- Salt
- Oil
- Tape
- Newspaper

PROCEDURE

1. Students will answer the question in their science journals.

2. As a whole group, students will discuss their answers. Teacher will record the answers on the board.

3. The teacher will explain that today the students will be helping to gather the seeds from the sunflower plants that were planted in the garden. This activity must be done after the sunflowers begin to wilt. **HINT:** Brainstorm as to why they are harvested this way. **ANOTHER HINT:** Brainstorm other ways to harvest seeds. Teacher will record thoughts and ideas.

4. The students will go out to the garden and tie paper bags securely over the heads of the sunflowers.

5. The teacher will come around afterwards and cut off the head of the flower and hand the bag to the student.

6. The students will take the bags inside and, over a table covered in newspapers, begin to shake the seeds into the bag.

7. After the students have shaken the bags, have them open them and see if any seeds are in the bags.

8. The students will remove the seeds. **HINT:** This is a great math opportunity: How many seeds fell off the flower? How many stayed on the flower? What is the difference?

9. The students will tape one seed in their science journals and write about their experience harvesting the seeds in the garden.

10. The teacher will hang the bags upside down in the classroom for the remainder of the seeds to dry to be harvested at a later date. **HINT:** Ask students why all the seeds didn't fall off the flower?

11. Prior to sorting the seeds to roast, teacher asks the students what it means if something is edible. Teacher will then give the guidelines for sunflower sorting: no spotting on the seed, seeds are somewhat plump and striped in color, and the seed should readily fall from the flower head.

12. The students will examine the seeds to see if they are edible and sort them according to the criteria the teacher has given them.

13. The teacher will then have the students bring the seeds to the sink and wash them thoroughly in a colander. At their tables, the teacher will have baking pans that have been oiled. The students will place their seeds on the pan and salt the seeds.

14. The teacher will bake the seeds at 300 degrees for 45 minutes.

15. The students will be allowed to taste the seeds after they have cooled.

16. The students should then write in their science journals what they learned.

17. The teacher will ask the question, *"Can you plant some of the roasted seeds? Why, or why not?"*

ASSESSMENT

- Class participation
- Science Journal entries

MODIFICATIONS

- Try planting some of the roasted seeds to see what happens.
- Try harvesting and roasting different seeds (Example: pumpkin seeds).
- Find other ways to harvest and prepare seeds that have been harvested.

DIGGING DEEPER

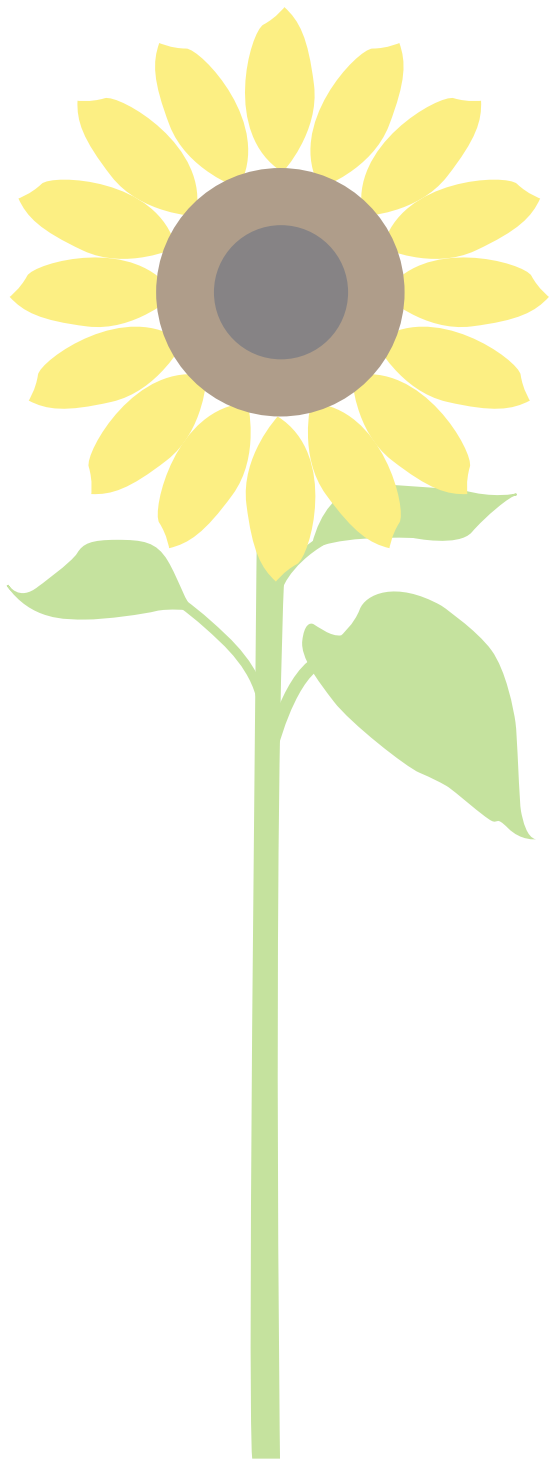
- To keep track of your crop rotation, have the students draw a picture of the garden. Use the pictures as a reference to rotate crops when planting again after harvest.
- Research what other schools are growing in their gardens. Don't limit the search to Las Vegas. Students can learn about the relationship between different climates and growing times from other areas across the U.S.

DID YOU KNOW?

- Crop rotation is when you grow different types of crops in the same area season after season. This helps to replenish the soil with various nutrients, such as nitrogen.

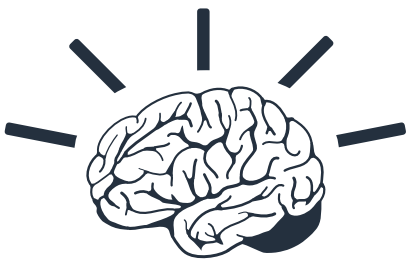
NUTRITIONT FACTS

- Sunflower seeds are a nutrient-dense food; they are an excellent source of protein, fiber, healthy fats, vitamin B and E, as well as iron, zinc, and other minerals.



Lesson Eight

Seed Dispersal



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13. Insect Talk Students will turn to a partner taking turns going back and forth naming a garden insect. Repeat until partners can no longer name insects.

OVERVIEW

Students will be able to understand how plants spread their seeds in order to regenerate.

OBJECTIVE

- Students will sort seeds based on how the seeds travel.
- Students will explain how seeds move.

STANDARD

Next Generation Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

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

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

TIME

4 days, 20-30 minutes each

(Plan lesson when sunflower seeds are available to harvest in the OC)

TEACHER INFORMATION

Many plants create seeds to ensure the continuation of the species. These seeds need to be dispersed (scattered/spread) in order to avoid overcrowding and to start new colonies of plants. The majority of seeds are produced within the 'fruit' of the plant. These fruits enable the seeds to be dispersed.

Seeds have different mechanisms for getting away from the parent plant. The basic mechanisms can be categorized into one of the following methods of seed dispersal:

Wind: These types of seeds are designed to 'catch the wind'. Many of these seeds are small with wings, hair-like structures or feather-like structures. Example: Dandelion seeds. Other wind-dispersed seeds may have larger wings like the Sycamore seed.

Water: Many plants that live near the water use this method of seed dispersal by floating or being carried by water. This explains how remote islands have similar vegetation to other lands miles away. The size of the seed doesn't determine if it will float; it's the buoyancy (densness) of the seed. The coconut seed is a great example of this – it's quite large, but it floats!

Animals: Animals disperse many seeds. One method plants use is producing seeds that can 'hitch a ride' on an animal. These seeds have some sort of barb and/or a structure that gets tangled in the fur or feathers of the animal and thus are carried to a new location. A cocklebur is an example of this type of seed. **By the way, the cocklebur was the inspiration for the invention of velcro.

Another way animals disperse seeds is through the digestive system of an animal. The plant produces a tasty fruit that animals want to eat. Within the fruit are the hidden seeds. The seeds then travel through the digestive system of the animal and are then 'dropped' in a new location. These seeds usually have a hard covering so that they can safely pass through the animal's digestive system without being damaged. Examples are: delicious apples, cherries, and strawberries.

Animals such as squirrels will often bury seeds in the ground (such as acorns), thus assisting the plants in both seed dispersal and also with planting.

Humans: Humans play a large role in seed dispersal by moving fruit to new places and discarding the inedible portions containing the seeds. Seeds also stick to socks, shoes, and other clothing. Vehicles and farm machinery can get seeds and plant parts caught underneath. Transported soil, animal feed, and seed can contain weeds. Humans are particularly adept at weed dispersal because they travel both frequently and over long distances.

Fire: When a fire occurs, animals have no roots so they can run, fly, or burrow into the ground to avoid the fire. Plants cannot move so they have no way to escape. some plants, however, are adapted to living in areas of frequent fires. Some pine trees, for example, only release their seeds from their pine cones when fires reach a certain temperature. These plants actually need fire to spread their seeds!

Vocabulary:

Dispersal: The act of sending off into various directions, scattered, spread widely.

Digestion: The process of breaking down food into forms that can be assimilated into the body.

Scarification: The act of making scratches or superficial incisions on the outer surface.

QUESTIONS

- How do humans, animals, and plants travel?
- Why is it important for plants to have seeds that are designed the way they are?

MATERIALS

- *Flip, Float, and Fly!: Seeds on the Move*
- On the Move t-chart
- Seeds Move table from *Books in Bloom*
- Seeds in the Garden chart
- *The Story of Peter Pan*
- Student journals

PROCEDURE

- Day One

1. Teacher will prompt students to discuss: How humans travel? How do animals travel? How do plants travel? Encourage students to move around the outdoor garden classroom to show different ways that humans travel and find examples of how animals and plants may travel.

2. Introduce the term “disperse” on a sentence strip.

3. Teacher will record answers on t-chart titled “On the Move “

4. Teacher will read *Flip, Float, and Fly!: Seeds on the Move*

5. Teacher will guide students to review answers by beginning a discussion and adding any additional thoughts after reading book.

- Day Two

1. Allow students time to explore the outdoor garden classroom and guide them to identify seeds by drawing detailed and labeled scientific sketches in their journals.

2. Teacher will display and/or distribute copies of the table "How Seeds Move" to students. Have students tape in their journals.

3. Create a chart titled "Seeds in the Garden" and record how the plants students identified would be dispersed.

- Day Three

1. Review Day 2 chart, "Seeds in the Garden." Prompt students to share what seeds they identified and how they would disperse.

2. Teacher will read *The Story of Peter Pan* (see attached pdf OR find a picture book version)

3. Ask students to identify the main characters.

4. Ask students how the character might be examples of seed dispersal (Captain Hook - animal, Tinkerbell - wind, Peter Pan - wind, Sail of the Ship-water, Cannon on the Ship - fire, Crocodile - digestion/scarification)

5. Introduce the vocabulary terms “digestion” and “scarification” on sentence strips.

▶ Day Four

1. Review main character/seed dispersal qualities.

2. Allow students time to review their journal entries from Day 2. Students should work together to identify the seeds in their garden and to add to the Peter Pan Character Chart. based on how they would travel. If enough examples to each type do not exist in your school garden, find examples online or source some at the Springs Preserve Nature Exchange.

ASSESSMENT

▶ Student Evidence Sheets included in Mapping

ADAPTATION

▶ For those who struggle with this concept:

- Have students sort a variety of seeds by methods of dispersal. Have the student find the common characteristics in each category. For example: what are the common traits of the seeds that are dispersed by wind, water, or animal?
- Students can draw seeds.
- Students can make a ‘paper copter’ to show how some seeds are dispersed. http://www.exploratorium.edu/science_explorer/roto-copter.html
- Spray with water bottle; soil should be moist throughout
- Place indoors in a sunny location or under grow lights (if under grow lights, be sure to keep the light as close as possible to the tops of the cups and move them up as the seedlings grow)

▶ For those who need a challenge:

- Have students design their own seed and a method of dispersal.
- Have students design a seed and a method of dispersal for each type:
  - Wind
  - Animal
  - Water
  - Human
  - Fire

- Create ‘races’ to compare seed designs:
  - Use a fan to test created wind dispersed seeds to see which design goes a longer distance.
  - Time to see how long water dispersed seeds will stay afloat compared to other created seeds.
  - Test which created animal dispersed seeds will stay on a sock (‘animal coat’) longer than the others.
- Students make paper copter (from website listed above or other site) and have races to compare them.

DIGGING DEEPER

- Use the Native Seed Search website to learn more about native seeds from the Southwest.
- The *Corn is Maize* book is a great book to learn more about the history, science, and social development of corn and the Native American cultures.

GARDENER TIPS

- Coordinate with your garden team or farmer to bring in samples of plants to show the students different parts of the plants.

NUTRITION FACTS

- Seeds rely on individualized environmental conditions to grow and regenerate; the unique environmental conditions in Nevada allow wheat to grow, which is our most lucrative crop.

LESSON MAP

Next Generation Science Standards

1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

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

K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

ELA

- **Reading**
  - RI.1 Ask and answer questions about key details in a text.
  - RI.2 Identify the main topic and retell key details of a text.
  - RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
  - RI.1.10 With prompting and support, read informational texts appropriately complex for grade.

- **Writing**
  - W.1.7 Participate in shared research and writing projects (e.g., explore a number of “how-to” books on a given topic and use them to write a sequence of instructions).

    W.2.8 Recall information from experiences or gather information from provided sources to answer a question.

    SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

Math

1.NBT.B3 Compare two, two-digit numbers based on meanings of the tens and ones digts, recording the results of comparisons with the symbols >, =, and <. (1-LS1-2)

1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properites of operations, and/or the relationship between addtion and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten. (1-LS1-2)

1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. (1-LS1-2)

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Lesson 7: Seed Dispersal

Day 1

- Discuss how humans, animals, and plants travel. Record answers on t-chart titled *On the Move* (included in this less)
- Read *Flip, Float, and Fly!: Seeds on the Move*
- Students will review answers to opening discussion and add any additional thoughts after reading book.

Day 2

- Identify seeds in the OGC.
- Share table of How Seeds Move from *Books in Bloom*.
- Fill in attached chart titled *Seeds in the Garden* on how they would be dispersed

Day 3

- Read *The Story of Peter Pan* (included later in this lesson or find a picture book version)
- Identify the main characters and how they are examples of seed dispersal (Captain Hook - animal, Tinkerbell -wind, Peter Pan-wind, Sail of the Ship-water, Cannon on the Ship-fire, Crocodile-digestion)

Day 4

- Review main character/seed dispersal qualities. Identify seeds in garden and add to Peter Pan Character Chart

Day(s) 2

Math Using seed/fruit chart from lesson 5, answer questions on Seeds in Fruit worksheet attached.

Day(s) 1, 3

Literacy connection
Flip, Float, and Fly!: Seed on the Move

Peter Pan character chart

Day(s) _____

Science/Social Studies
Extension Garden Observation

Name:_____

Date: _____

ON THE MOVE

How do humans travel?	BEFORE READING	AFTER READING
		
How do animals travel? 		
How do plants travel? 		

Name:_____

Date: _____

SEEDS IN FRUIT

1. How many seeds were in the bell pepper?

_____ seeds

How many seeds were in the cucumber?

_____ seeds

2. All together, how many seeds did the bell pepper and cucumber have?

_____ bell pepper seeds + _____ cucumber seeds = _____ seeds

3. How many seeds were in the orange?

_____ seeds

How many seeds were in the apple?

_____ seeds

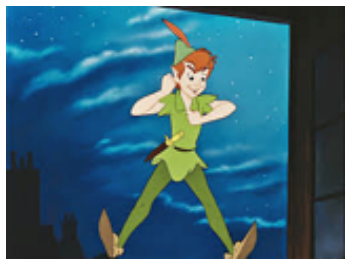
4. All together, how many seeds did the orange and apple have?

_____ orange seeds + _____ apple seeds = _____ seeds

Name:_____

Date: _____

PETER PAN CHARACTER CHART

Peter Pan 	Wind	Seed from the Garden
Captain Hook 	Animal	Seed from the Garden
Tinkerbell 	Wind	Seed from the Garden
Sail of the Ship 	Water	Seed from the Garden
Cannon on the Ship 	Fire	Seed from the Garden
Crocodile 	Digestion/Sacrification	Seed from the Garden

PETER PAN SHORT STORY

This is a short version James M. Barry's *Peter Pan* story, perfect for reading to children.

Wendy, John, and Michael Darling lived in London. One night, Wendy woke to find a strange boy sitting on the floor who was crying.

"My name is Wendy," she said. "Who are you? Why are you crying?

"I'm Peter Pan," the boy replied. "I'm crying because my shadow won't stick to me."

"Don't cry," Wendy said. "We can fix that." And she sewed Peter's shadow to the tips of his shoes. Peter was delighted.

"Fly back to Neverland with me and my fairy, Tinker Bell," Peter begged. "You could be our mother and take care of us."

"Can you teach me to fly?" Wendy asked. Peter nodded.

"Let's wake John and Michael," Wendy said. "You can teach us all to fly and then we will leave for Neverland!"

The children were soon flying around the room. Then—Swoosh! Out the window they all flew.

Wendy, John, and Michael flew behind Peter Pan and Tinker Bell, following the golden arrows that pointed the way to Neverland. Finally, they were flying over the island.

"The lost boys live with me and Tinker Bell. I'm their captain," Peter said. "The Indians live over there, and the mermaids live in the lagoon. And there are pirates too, led by Captain Hook."

"Pirates?" exclaimed Wendy, John, and Michael, all in the same breath. Wendy was frightened, but Michael and John wanted to see the pirates right away.

"Hook's the meanest pirate ever," Peter warned. "But he's afraid of the crocodile. The crocodile bit off Hook's hand and liked the taste so much that it follows him, hoping for more. Luckily for Hook, the crocodile swallowed a clock. It goes 'Tick, Tock, and warns Hook when the crocodile is nearby"

"Oh, my" cried Wendy, not sure if she really wanted to stay in Neverland, after all.

Peter led Wendy, John, and Michael to his house under the woods. They entered through a door hidden in an old tree stump. When the lost boys saw Wendy, they shouted, "Hooray ! Will you be our mother?"

"I'm only a little girl," Wendy answered. "I have no experience." But the lost boys looked so sad that she said, "I'll do my best."

That night, Wendy tucked the boys into bed and told them the tale of Cinderella.

Life was pleasant in the cosy house under the woods.

PETER PAN SHORT STORY (CONTINUED)

Wendy took care of the boys, who explored the island during the day. At night, they gathered for meals, played make-believe games, and listened while Wendy told them stories.

One day, Peter and the children went exploring near the mermaids' lagoon. Suddenly Peter yelled, "Pirates! Take cover! The boys ran away, and Peter and Wendy hid.

Peter and Wendy could see that the pirates had tied up Tiger Lily, the Indian princess. The pirates had left her on a rock in the lagoon.

Peter was afraid that Tiger Lily would drown when the tide came in. He had to save her! In a voice that sounded just like Captain Hook's, he shouted, "Set her free !"

"But, Captain," the pirates yelled, "you ordered us to bring her here!"

"Let her go!' Peter roared, still sounding like Hook. "Aye, aye," the pirates said, and set Tiger Lily free. She swam quickly back to the Indian camp.

When Captain Hook found out what had happened, he knew Peter had tricked his pirates. Hook became furious!

That night, Wendy told the boys a story about three children who left their parents and flew to Neverland. Their mother and father missed them very much. The children loved Neverland, but they never forgot their home.

"Did they ever go back?" the lost boys asked.

"Oh, yes," Wendy replied. "They flew home to their mummy and daddy, and everyone was happy."

The story made Wendy, John, and Michael homesick. They decided to fly home the next morning. "If you come back with us," Wendy told the lost boys, I'm sure our mother and father would adopt you."

"Hooray!" shouted the boys, jumping with joy.

Wendy asked Peter if he and Tinker Bell would come home with them too. But Peter didn't want to live where grownups could tell him what to do.

Peter was sad that his friends were leaving. Still, he wanted the children to arrive home safely, so he asked Tinker Bell to guide them on their trip.

Early the next morning, Tinker Bell and the children left the house under the woods. But Captain Hook's pirates were hiding nearby. They captured all the children, tied them up, and marched them towards the pirate's ship.

Tinker Bell escaped and hurried back to tell Peter what had happened.

"It's Hook or me this time!" yelled Peter to Tinker Bell as they flew off to save Wendy and the boys.

On the pirate's ship, Captain Hook demanded, "Who wants to become a pirate?" The boys shook their heads.

PETER PAN SHORT STORY (CONTINUED)

"Then make them walk the plank!" Hook roared. The boys tried to look brave, but they were afraid.

Suddenly, they heard the "Tick, Tock" of the crocodile. Now it was Captain Hook's turn to be afraid.

But the "Tick, Tock" was only Peter, imitating the crocodile. He flew onto the deck and shouted, "I've got you now, Hook!" Captain Hook jumped up and swung at Peter with his sword. Peter was quick, and stepped away. He slashed at Hook with his own sword until they came close to the edge of the ship.

Peter lunged with his sword, and Hook fell into the sea, where the crocodile was waiting for him. And that was the end of Captain Hook!

When Peter was certain that Hook was gone forever, he and Tinker Bell set off for London with Wendy and the boys.

Wendy's parents were happy to see their children again. Mr. and Mrs. Darling hugged Wendy, John, and Michael, and agreed to adopt the lost boys. They asked Peter to stay with them also, but he said, "I'm going to stay in Neverland where I never have to grow up."

"Goodbye then, Peter. We'll miss you," everyone called. Peter Pan and Tinker Bell waved goodbye and flew home to Neverland.

Seed travelers

Background knowledge

A plant produces many seeds. If all the seeds fell to the ground beside the plant, they would not all be able to *germinate* (grow). The area would become overcrowded. There would not be enough water and minerals for all the seeds. In order to avoid this, seeds have developed that can be transported to other areas. Some seeds can be dispersed by the wind or by water. Seeds inside juicy fruits are dispersed after being eaten by birds and other animals. Sometimes, seeds stick to animals and are dispersed that way.

Sycamore seeds are dispersed by wind.

Apple seeds are usually dispersed by animals.

Coconut seeds are dispersed by water.

Science activity

Look at the seeds below. In the boxes, write **W** for those that are dispersed by wind and **A** for those dispersed by animals.

Blackberry ☐

Cherry ☐

Dandelion ☐

Pine cone ☐

Explain how an apple seed might be dispersed by water.

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Science investigation

Build a model of two or more types of seeds that can be carried by the wind. Make the models out of paper. Test the seeds by dropping them. The one that takes the longest to land has the greatest wind resistance. Which one is best suited for transport by the wind? Explain.