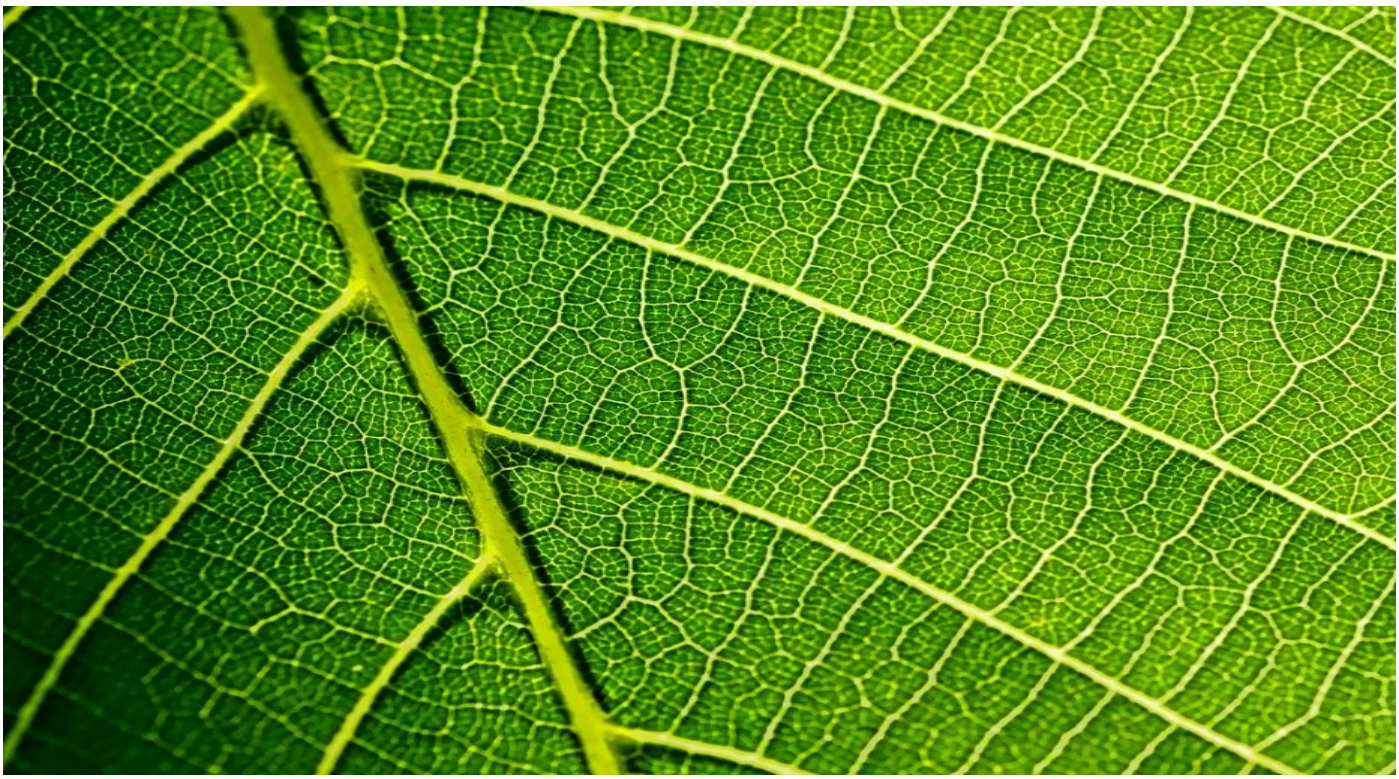
3rd Grade Life Science: Plants Unit

NORTHSIDE
Outdoor Wonder & Learning



Developed for Chapel Hill Carrboro City Schools
Northside Elementary School Outdoor Wonder & Learning (OWL) Initiative

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CHAPEL HILL-CARRBORO CITY SCHOOLS

UNC INSTITUTE FOR THE ENVIRONMENT

Center for Public Engagement with SCIENCE

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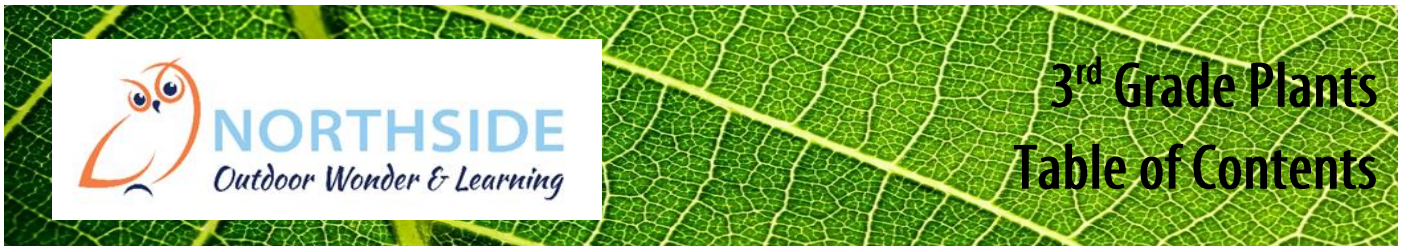

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3rd Grade Plants

Overarching Unit Question

How do plants survive in different environments?

Essential Questions

Arc 1: Why is soil important?
Arc 2: How do the systems and structures of plants function to support life?
Arc 3: How do environmental conditions affect plant growth?

Transfer Goals

- Use scientific approaches and methodologies to investigate phenomenon, claims, results and information.
- Use scientific thinking to understand the relationships and complexities of the world around them.

Enduring Understandings (Science)

- We can learn about the world around us by observing its features, patterns, and changes.
- Living organisms have systems and structures that function to support life.
- Living organisms experience cycles that vary over the span of their lives.

Target Science Essential Standards

3.L.2 **Understand** how plants survive in their environments**.**

3.L.2.1 **Remember the function of the following structures** as it relates to the survival of plants in their environments**:**

- **Roots –** absorb nutrients
- **Stems –** provide support
- **Leaves –** synthesize food
- **Flowers –** attract pollinators and produce seeds for reproduction

3.L.2.2 **Explain** how environmental conditions determine how well plants survive and grow.

3.L.2.3 **Summarize** the distinct stages of the life cycle of seed plants.

3.L.2.4 **Explain** how the basic properties (texture and capacity to hold water) and components (sand, clay and humus) of soil determine the ability of soil to support the growth and survival of many plants.

Secondary Target Standards (ELA, Math, Social Studies)

ELA

RL.3.4 Determine the meaning of words and phrases as they are used in a text, identifying words that impact the meaning in a text.

RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
RI.3.5 Use text features and search tools to locate information relevant to a given topic efficiently.
W.3.2 Write informative /explanatory texts to examine a topic and convey ideas and information clearly.
W.3.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.
SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly in complete sentences at an understandable pace.

Math

3.OA.3 Represent, interpret, and solve one-step problems involving multiplication and division.
3.MD.2 Solve problems involving customary measurement.
3.MD.3 Represent and interpret scaled picture and bar graphs.

Unit Overview

In this unit, students will learn all about plants starting with the soil in which they grow. Throughout the unit, students will be going outside to make connections between the content and the plants around school. In Arc 1, students will begin to identify the importance of soil and how soil relates to plants. Students will design experiments involving growing plants from seeds.

Exploring the parts of plants and the life cycle of plants is the focus of Arc 2. Each plant part deservingly receives its own learning activity. Two learning activities study the life cycle of plants, one focusing on trees.

In Arc 3, students will then investigate how environmental conditions affect plants. The culminating activity examines how the environmental conditions students imposed affected the growth of their seeds planted during their experiment at the end of Arc 1.

Note: You may want to ask students at the beginning of the unit to bring in materials, such as empty paper towel rolls, toilet paper rolls, cereal boxes, or granola bar boxes, to share with the class for Learning Activity 15: Design & Build a Plant.

Duration

21 days of 30 minute learning activities

Vocabulary*

Soil, sand, silt, clay, topsoil, humus, nutrients, plant, leaf, root, stem, seed, seedling, flower, fruit, function, photosynthesis, pollination, germinate, environment, drought, botanist

** Definitions of vocabulary words can be found on the Arc overview pages. Relevant vocabulary is also listed on each learning activity page.*

Go Outdoors! Tips & Tools

Taking your class outside for science or any lessons can be rewarding and challenging. Along with behavior and materials management tips with each lesson, this section is intended to help you have the tools you need to successfully take your class outside.

Before You Go Outside

- Create **ground rules** with students for all outdoor lessons. Post the rules for students to be able to easily see.
- Ask for **parent volunteers**. Extra help can make an outdoor learning experience much more manageable.
- Teach students proper use, including safety, of the science tools they will be using.
- Set expectations before go. Give instructions both inside and repeat once outside.
- Have a clear **objective** for going outdoors. This will help focus students' attention.
- Be flexible. Structure lessons to take advantage of **opportunities and challenges**.
- Establish a meeting spot and emergency plan. Have a signal for emergency situations.
- Take students outside for short exercises to practice rules before longer outdoor lessons.
- Use **same door** to always go outside for learning. Emphasize this is different than going outside for recess.

While You Are Outside

- **Model** the activities and outdoor skills for students. Show them what you expect them to be doing.
- **Participate in the activity**. Get down on your students' level. Get your hands dirty.
- Model **respect for nature** with your students.
- The outdoors is full of **teachable moments**. Use "I wonder" statements to engage students in questioning the experience. Have students write down questions to be researched back in the classroom.
- Allow students to be **leaders** in the activity. Ask students to volunteer as teacher assistant or materials manager.
- Acknowledge that students want to explore and can do so once the assigned task is complete.

Safety First!

- Scout outdoor areas ahead of time if possible, to note **potential hazards** such as poison ivy.
- Students should **never be alone**. If a student needs to go back to the building, send 2 students.
- Take a **first aid kit and phone/walkie-talkie**. Consider bringing along staff trained in first aid/CPR.
- Let office staff know where you and your class are going if headed out on a walking field trip.
- **Stay on the trail/path**, unless otherwise directed. On the greenway, stay on the right side of path.
- **Do not eat wild plants**, unless harvesting in the garden with a teacher.
- Set **boundaries** for the students to stay within. You have to be able to see me and I have to be able to see you!

A Note on Nature Journaling

Nature journals that you use with your class should be small composition books or other blank books that students use to make outdoor observations, including writing, drawing, and painting. Students can use colored pencils, watercolor pencils, or other materials to remember details of plants, animals, and habitats they are investigating around the schoolyard. This is different from a science notebook. However, some teachers may choose to have students paste blank pages into their science notebook to use for nature journaling pages.

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Arc 1 – Soils

Essential Questions

Why is soil important?

NC Science Essential Standards – Unpacked Content

3.L.2.4 Students know that different soils possess different textures and capacities for the retention of water and nutrients. Students know that soil consists of different components. Students know that these characteristics of soil influence the growth and survival of plants.

Lessons in this Arc

- Engaging Activity: What Do You See?
- Learning Activity 1: What is in soil?
- Learning Activity 2: How Does Water Move Through Soil?
- Learning Activity 3: Compost
- Learning Activity 4: From a Seed to a Plant - Part 1

Go Outdoors!

- ✓ Engaging Activity: What Do You See?
- ✓ Learning Activity 3: Compost

Nature Journal Connection

- Engaging Activity: What Do You See?
- Learning Activity 3: Compost

Duration

5 days of 30 minute lessons

Background Information

Soil is responsible for supporting the growth and survival of many plants. **Soil** is made of weathered minerals, organic matter, water, and air and is the outermost layer of the earth. Soil texture refers to the particle size of the rock pieces, which are classified as sand, silt, or clay. Particles of **sand** are the largest pieces of weathered rock that make up soil. With large spaces between the grains, sand does not hold water well. In order to provide water to plants, the soil must be able to retain it. Due to this and sand's lack of nutrients, many plants do not grow well in sandy soil. **Silt** is made of rock fragments that are smaller than grains of sand and larger than grains of clay. Silt feels smooth and velvety like flour. **Clay** is made up of the smallest particles and, therefore, does hold water well. Clay feels sticky when wet. It can be gray, red, or yellow.

Topsoil is the outermost layer of soil where plants and animals live. It is the best soil for plants to grow in because of ample nutrients and water. Topsoil consists of humus and small particles of rock. **Humus** is the rotten remains of plants and animals, broken down by decomposers. This organic part of soil provides **nutrients** to the soil that

plants need to be able to live. Nutrients that plants need to grow include nitrogen, phosphorous, and potassium. Compost is created when the decomposition of the remains of plants and animals by microorganisms is sped up due to where and how the remains are kept. Anything made from organic materials, such as grass clippings, paper towels, and apple cores, can be added to a compost pile. Once fully decomposed, compost can be added to the soil to enrich its nutrient content.

Vocabulary

- **Clay** is a type of soil made up of very small particles and holds water very well.
- **Humus** is rotting or rotten plants and/or animals that provides nutrients to the soil.
- **Nutrients** are materials needed for plants to grow and develop.
- **Sand** is a gritty feeling type of soil made up of small grains of weathered rock.
- **Silt** is a type of soil made up of very small pieces of broken rock.
- **Soil** is the outermost layer of the earth made up of a mixture of minerals, organic matter, water, and air.
- **Topsoil** is the top layer of soil where many plants and animals live. It is made of humus and rock.

Literature Connections

Online

Articles from *Soil-Net.com*:

- *How Do Soils Form*
- *Properties of Soil*
- *What is Soil? Fact Sheet*
- *Why Does Soil Matter? Fact Sheet*
- *Why and How Soils Differ*
- *Soil, Plants and Food Production*
- *Thirsty Plants*

Books

- *Diary of a Worm* by Doreen Cronin (E CRO)*

Book sets

- *Compost Basics* by Mari Schuh*
- *Soil Basics* by Mari Schuh*

*currently available in Northside Elementary's media center

Engaging Activity
What Do You See?

Lesson Prep

- ✓ Preview the slideshow and video.
- ✓ Make copies of the *Why Does Soil Matter?* graphic organizer, 1 per student.
- ✓ Make copies of the *Soil Nature Journaling Prompt*, 1 per student.
- ✓ Determine where you will take your class outside and note any potential safety hazards.

Vocabulary

Soil, clay, topsoil, humus

Procedure

Mini-Lesson

- Use the slideshow *What do you see?* to start a conversation about soil.
- Students should talk about what they see in each slide for slides 2 through 7.
  - You can do this through a class discussion of each slide or by having students turn and talk to a partner.
  - The objective is to get students to make the connection that without soil we wouldn't have food, shelter, clothing, etc.
- For the second half of the slideshow, you will be giving them information on how each picture connects to soil (and plants). For these slides, ask students for a thumbs up or down if they made the same connections.

Guided Practice

- Watch the video clip from *Soil-Net .com*
  - Click on the link.
  - Click on "Digging Shallow".
  - Click on "Why does soil matter?".
  - Continue clicking through the video when prompted.
- Students will complete the table on the *Why Does Soil Matter?* graphic organizer while watching the clip.

Independent Work

- Before going outside, have students glue the nature journaling prompt into their journals.
- After the video, take students outside to the garden. Have them write a response to the **Nature Journaling** prompt**:**

Learning Objectives:
Students will make a connection between life and soil.

Nutshell/Skill:
Students can give examples of why soil is important.

Science Essential Standards:
3.L.2.4

ELA Essential Standards:
SL.3.1, W.3.2

Time:
30 minutes

Teacher Materials:
- *"What do you see?"* slideshow
- Video clip on *Soil-Net .com*

Student Materials:
- Nature Journals
- *Soil Nature Journaling Prompt*
- Writing utensils
- *Why Does Soil Matter?* graphic organizer

- Soil is not dirt! Dirt is unwanted and not necessary. Soil, on the other hand, is extremely wanted & extremely necessary. Without soil there is no life! Soil is essential for life above the ground and in the ground. "Soil is the foundation of every terrestrial ecosystem." *(Know Soil Know Life, 2012)* Plants and animals are adapted to the type of soil within their ecosystem. Describe in a paragraph the evidence of soil's importance that you see around you.

Assessment

- Students' nature journaling responses can serve as a formative assessment. You could have some students read their paragraphs aloud to the class or share within a small group.

Behavior Management Tips

- Before taking your class outside, discuss outdoor learning behavior expectations.

Name _____ Date _____

Why Does Soil Matter?

Why is soil important?	**Examples from video clip:**
Grows food	
Helps trees grow	
Helps plants & animals	
Helps buildings and roads	

Name _____ Date _____

Why Does Soil Matter?

Why is soil important?	**Examples from video clip:**
Grows food	
Helps trees grow	
Helps plants & animals	
Helps buildings and roads	

Soil Nature Journaling Prompt:

Soil is not dirt! Dirt is unwanted and not necessary. Soil, on the other hand, is extremely wanted & extremely necessary. Without soil there is no life! Soil is essential for life above the ground and in the ground. "Soil is the foundation of every terrestrial ecosystem." *(Know Soil Know Life, 2012)* Plants and animals are adapted to the type of soil within their ecosystem.
Describe in a paragraph the evidence of soil's importance that you see around you.

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Describe in a paragraph the evidence of soil's importance that you see around you.

Learning Activity 1
What is in Soil?

Lesson Prep

- ✓ Preview the slideshow from StudyJams.
- ✓ Collect soil from the school garden or other outdoor location. Do not use purchased, bagged soil from a store, as you want the sample to contain all the ingredients of soil.
- ✓ Make copies of the graphic organizer and lab notes for each group.

Vocabulary

Soil, nutrients, clay, humus, sand, silt, topsoil

Procedure

Mini Lesson

- Use the slideshow on *StudyJams: Soil* to introduce what is found in soil.
- **Note:** the link for the image of a soil horizon is broken in the slideshow. The Soil Science Society of America has an informative *webpage about soil horizons* with an image.

Independent Group Work

- Use the *Soil Ingredients* lab on the UEN website to have students explore what is found in soil.

Assessment

- **Exit ticket:** Ask students to list the four ingredients of soil. Beside each ingredient, ask them to identify it as living, nonliving, or once living.

Behavior & Materials Management Tips

- ♦ Instruct students to keep all parts of the soil either on the newspaper or on their sorting sheet.
- ♦ Have a clean-up plan. In particular, be prepared with a container for the soil.

Learning Objectives:
Students will be able to recognize that soil is made of living and non-living things.

Nutshell/Skill:
Students can identify living and non-living parts of soil.

Science Essential Standards:
3.L.2.4

Math Essential Standards:
NC.3.MD.2

Time:
30 Minutes

Teacher Materials:
- *Slideshow* on soil from StudyJams
- Soil Ingredients lab instructions from UEN

Student Materials:
For each group:
- 1 cup of soil (not potting soil)
- Graphic organizer for sorting parts of soil
- *Soil Ingredients Lab Notes*
- Private Eyes
- Tweezers
- Measuring tape or ruler
- Newspaper

Soil Sorting Sheet

Animal	Plant	Mineral

Names _____

Soil Ingredients Lab Notes

Use the soil parts you have sorted into the boxes labeled Animal, Plant, and Mineral to answer these questions.

1. Which section has the most sample pieces? _____

2. Which section has the largest pieces? _____

3. Measure the width, height, and depth of your largest rock particle. Record the number to the quarter inch.

width _____ height_____ depth_____

4. Name an object that is about the same size as your largest rock. _____

5. Look at the rocks in your sample with your magnifier. Describe their color and shape. Record other observations.

_____

_____

6. Do you think you could easily break the rock particles into smaller pieces? _____

Why or why not? _____

7. Looking at the soil as a whole, do you think that it is about the same color as the individual rocks? _____

Why or why not do you think this is so? _____

8. What are the ingredients of soil?

_____

Adapted from Soil Ingredients Worksheet from https://www.uen.org/lessonplan/view/2494

Learning Activity 2
How Does Water Move Through Soil?

Adapted from *Soil Solutions* by Liz Driscoll for NC Cooperative Extension.

Lesson Prep

- ✓ Make copies of the *Soil Particles* graphic organizer, 1 per student.
- ✓ Determine where the activity will take place.

Vocabulary

Soil, sand, silt, clay

Procedure

Mini-Lesson

- Sand, silt, and clay particles make up the texture of the soil. Texture determines how much water the soil can hold.

Guided Practice

Note: This activity is a modification of *Soil Particle Play* from *Soil Solutions* by Liz Driscoll for NC Cooperative Extension. **Contact** your *local 4-H Youth Development Extension Agent* for a free electronic copy of the entire curriculum. Extension agents can also come to your school to assist with implementing this or another NC Cooperative Extension activity. **Additionally, please contact them to provide basic demographic data** about your students for NC 4-H federal reporting purposes when you use this activity. For Chapel Hill and Orange County, contact Jonathon Smith with *Orange County Center N.C. Cooperative Extension* at jonathon_smith@ncsu.edu or 919-245-2057.

Learning Objective:
Students will be able to demonstrate how water moves through soil.

Nutshell/Skill:
Students can compare the movement of water through different soil textures.

Science Essential Standards:
3.L.2.4

Time:
30 minutes

Teacher Materials:
- String or yarn
- Plenty of space, preferably outdoors
- *Soil Particles* answer key

Student Materials:
- *Soil Particles* graphic organizer

To illustrate the relationship between particle size and the spaces between the soil particles, students will be performing in the great **Soil Particle Play**.

- Tell the students they are going to be **soil particles**. Ask students to define what a particle is. A **particle** is an individual piece of soil.
- Have students stand up in a cluster and spread their arms out and position themselves **fingertip to fingertip**. Have students drop their arms and tell them that they are **sand particles**. Explain that all of the space in between them is occupied by air, which allows plants and animals to thrive and also allows water to travel through soil.
- Pick one student to be a **drop of water** & another student to be a **tree**. Have the **drop of water** stand outside of the students & the **tree** in the middle of the students who are now **soil particles**.
- Give the **tree** a string and tell everyone that the string represents a **root**. Give the other end of the string to the **drop of water**.
- Have the **tree** pull the **water** through the **sand particles**. (Model how the tree will pull gently on the string and drop of water.)

- At this point, ask the **tree**:
    - Was it difficult to pull the **water** to you? Why was it easy?
    - The connection should be made that it was easy to get the **water** to the **tree,** because the **sand particles** are spread out which allows for easier movement.
    - Discuss with students that **sand** does allow **water** to move easily, but it doesn't hold enough **water** for some plants to survive. This is **sandy soil**. Most of the particles in the soil are sand.
- **Repeat** the activity, but this time have the students spread themselves out **elbow to elbow** and then drop their arms. This time they will be **silt particles.** This is silty soil. Most of the particles in the soil are silt.
    - You may want to give different students the opportunity to be the **tree** and **drop of water** for this round.
- Have the **tree** try to pull the **water** to him/her again. (Discuss safety. Remind to pull gently.)
- Ask the students:
    - Was it difficult to pull the **water** to you? Why or why not?
    - The connection should be made that it was more difficult to get the **water** to the **tree**, because the **silt particles** are closer together which makes water movement more difficult.
    - Discuss with students that **silty soil** does a better job of holding water in the soil, because the soil particles are closer together.
- **Repeat** the activity again, this time have the students stand **shoulder almost to shoulder**. This time they are **clay particles**.
- Have the **tree** try to pull the **water** to him/her again. (Discuss safety. Remind to pull gently.)
- Ask the **tree**:
    - Was it difficult to pull the **water** to you? Why or why not?
    - The connection should be made that it was more difficult to get the **water** to the **tree**, because the **clay particles** are very closer together which makes water movement difficult.
    - Discuss with students that clay holds too much water for some plants to survive. Plants have to be adapted to soil that retains or holds a lot water. This is **clayey soil**. Most of the particles in the soil are clay.
- Repeat the activity one more time. This time assign some students to be **sand**, others to be **silt**, and others to be **clay**. Have them stand in clusters. Organize clusters into a maze. The object is for the **water droplet** to have to move around more to get to the **tree**. This type of soil is called **loam**. It has a mixture of all the 3 particles (sand, silt, clay).
- Have the **tree** try to pull the **water** to him/her again. When the **water** gets to the **tree**, have students go back to their seats.
- The ideal type of soil for growing plants is **loam.**

Independent Work

- Have students complete the *Soil Particles* graphic organizer.

Assessment

- Use the *Soil Particles* graphic organizer as an assessment.

Opportunities for Extended Learning

1. Learning Activity from UEN: *Sand, Clay, and Humus Lab*
    - Students explore the differences between humus, sand, and clay. They will observe these samples dry, wet, and in settling tubes.

Behavior and Materials Management Tips

- Remind students to be aware of those around them and to move their bodies mindfully as they will be close to other students for this activity.

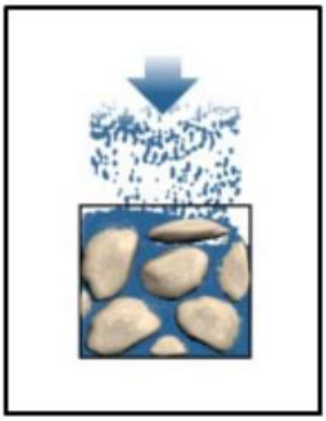
Name: _____ Date: _____

Soil Particles

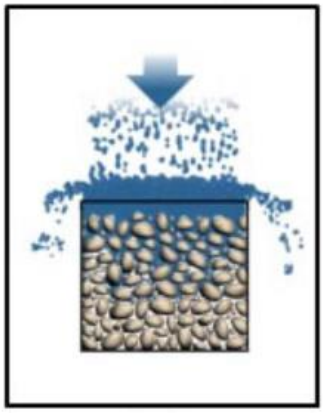
1. Complete the chart below.

Type of Soil	Holds Water (yes, no, some)
Sand	
Silt	
Clay	
Loam (mixture of sand, silt, clay)	

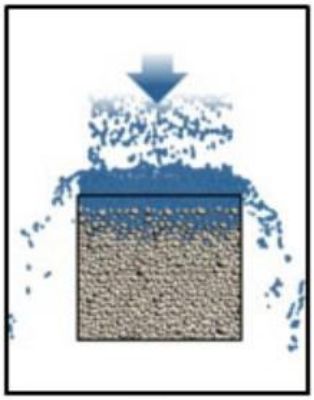
2. Name each one of the soil particles shown below.



1.



2.



3.

3. Based on our activity, why is loam the best soil for growing plants?

_____

_____

_____

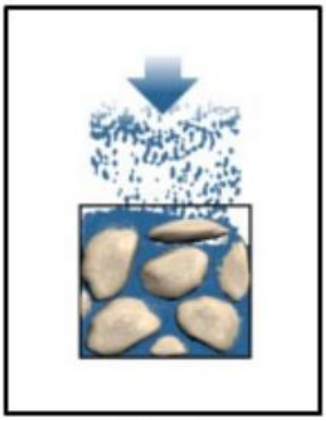
ANSWER KEY

Soil Particles

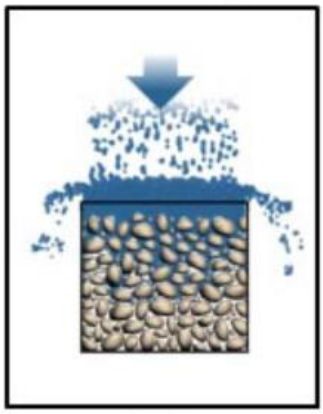
1. Complete the chart below.

Type of Soil	Holds Water (yes, no, some)
Sand	no
Silt	some
Clay	yes
Loam (mixture of sand, silt, clay)	yes/some

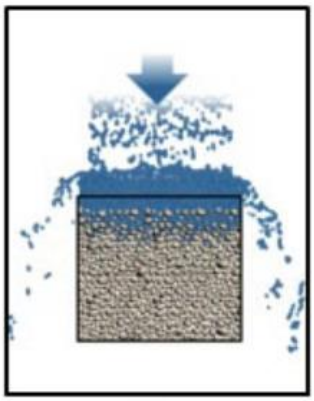
2. Name each one of the soil particles shown below.



1. sand



2. silt



3. clay

3. Based on our activity, why is loam the best soil for growing plants?

holds the right amount of water for many different kinds of plants to grow; has the benefits of all 3 types

Learning Activity 3
Compost

Adapted from *Soil Solutions* by Liz Driscoll for NC Cooperative Extension

Lesson Prep

- ✓ Determine if you will be taking the class outside to the compost pile in the school garden or bringing compost into class. If bringing compost to the class, collect enough compost for the class broken up into small groups.
- ✓ Make sets of the Compost Card Sort, 1 per group. The cards are available on the *Soil Solutions* webpage as a sample of the curriculum.
- ✓ **Note:** This activity is from Lesson 8 Composting from *Soil Solutions* by Liz Driscoll for NC Cooperative Extension. **Contact** your *local 4-H Youth Development Extension Agent* for a free electronic copy of the entire curriculum. Extension agents can also come to your school to assist with implementing this or another NC Cooperative Extension activity. **Additionally, please contact them to provide basic demographic data** about your students for NC 4-H federal reporting purposes when you use this activity. For Chapel Hill and Orange County, contact Jonathon Smith with *Orange County Center N.C. Cooperative Extension* at jonathon_smith@ncsu.edu or 919-245-2057.

Learning Objectives:
Describe what compost is and why it is important.

Nutshell/Skill:
Students can determine whether or not something is compostable.

Science Essential Standards:
3.L.2.4

ELA Essential Standards:
W.3.2

Time:
30 minutes

Teacher Materials
- Lesson 8 Composting from *Soil Solutions* by Liz Driscoll for NC Cooperative Extension

Student Materials
- Nature Journals
- Private Eyes or hand lenses
- Writing utensils
- Sample of compost
- Compost Card Sort cards

Vocabulary

Soil, humus, nutrients

Procedure

Mini-Lesson

- **Ask** students:
  - What is **compost**?
  - How is it different from soil?
  - List 3 things you might find in the compost pile in the school garden.
  - List 3 things you might put in a compost pile at home.
  - What is something from your lunch today that could go in a compost pile?
- **Record** answers on the board of items that are compostable.
- **Explain** that as the materials decompose, compost adds nutrients to the soil which plants use to grow.

Independent Group Work

- Bring a **sample of compost** from the garden into the classroom to observe or take the class to the compost pile for observations.
- Give each group of 2-4 students a small sample of compost to observe with the Private Eyes.

- **Nature Journaling Prompt:** 
  - How does compost help plants grow? What is compost adding to the soil?
- Have students do the **Compost Card Sort** from Lesson 8 Composting from *Soil Solutions.*

Assessment

- Have groups share how they sorted their cards as a formative assessment.
- **Exit ticket**: What is one item that you could compost today instead of putting it in the trash?

Compost Card Sort Answer Key

Compostable:

- Dead Leaves
- Coffee Grounds
- Newspaper
- Weeds
- Eggshells
- Potato Chips
- Hair
- Algae
- Cardboard
- Sawdust

Not Compostable in Backyard Compost:

- Ashes (if from wood, too much will slow the process; if not from wood, will resist decay)
- Lint (can contain fabrics that don't decay)
- Pet Waste (may contain parasites and pathogens)
- Cat Litter (may contain parasites and pathogens)

May Be Compostable in a Commercial Facility (higher heat):

- Diseased Plants (diseases may survive and be transferred to other plants)
- Fish (may attract pests)
- Cheese (may attract pests due to odors)
- Meat (may attract pests due to odors)
- Yogurt (may attract pests due to odors)
- Milk (may attract pests due to odors)
- Pine Needles (waxy coating resists decay)

Opportunities for Extended Learning

1. Have the soil tested, and then add compost to the school garden.
2. Watch the video *Make the Most of Compost!* From SciShow Kids (5:19). You can adjust the playback speed in settings if you find the characters talk too fast.

Behavior & Materials Management Tips

- Have a plan for managing the compost samples while students are making observations and for when they are done. Will they write in their Nature Journals while making their observations or after they have cleaned up the compost samples?

Learning Activity 4
From a Seed to a Plant: Part 1

Lesson Prep

- ✓ Make copies of *From a Seed to a Plant: Part 1* and *A Seed's Journey* data sheets, 1 per student.
- ✓ Obtain and gather materials.
- ✓ Determine a location for plants to grow in your classroom.

Vocabulary

Soil, seed

Procedure

Students will perform an experiment on plant growth and environmental conditions which will be concluded at the end of the unit in Learning Activity 16 – From a Seed to a Plant: Part 2.

Mini-Lesson

- Ask the students to remind you of what a plant needs to survive - **sunlight, water, air, and nutrients**.
- Ask students if all plants need the same amount of these. Briefly talk about how different plants have different soil and water requirements.
- Explain that groups will be performing experiments to learn more about the needs of the seeds they will be planting.
- As a class, decide if you want to test **either** the effects of **soil or water** on plant growth.
    - The **whole class** should focus on either soil or water. Within that variable students should be allowed to create an experiment, i.e. how much water will they use daily, how frequently will they water, compare the different types of soils studied, combine types of soils in varying amounts.
    - Create an **overarching question** for the students' experiments to fit under, such as "*In what types of soil do plants grow best?"* or *"How much water do plants need*?"
    - **Example experiment**: Students compare the growth of their seeds using two different neighborhood soil samples. Students will use two identical containers to plant two seeds of the same kind. Students will measure out the soil, so each container has the same amount of either soil sample one or soil sample two. The seeds will be watered at the same frequency with the same amount of water.
- Each group should only be testing **one variable** with everything else remaining the same.

Learning Objectives:
Observe how the environment, i.e. type of soil or amount of water, affects the growth of a plant.

Nutshell/Skill:
Students can design and set up experiments about plants and how they are affected by their environment.

Science Essential Standards:
3.L.2.2, 3.L.2.3, 3.L.2.4

ELA Essential Standards:
W.3.2, W.3.3, SL.3.1, SL.3.3

Time:
30 Minutes, plus a few minutes daily to collect data as plants grow
A Seed's Journey - 15 Minutes

Student Materials:

- Containers to plant in
- Seeds
- Soil
- Spoons
- Measuring cups for water and soil
- Rulers
- Data sheets
- Masking tape

- The teacher should plant seeds as the **control group** for the class. This also is a way to **model** to the students how to plant the seeds.

Independent Group Work

- Have students work together in groups of 2-4.
- Planting seeds:
  - Seeds can be planted in cups or other containers. Consider putting holes in the bottom of the container to allow for water drainage. You may want to then put the containers on a tray or other method to catch the drained water such as two different sized cups.
  - Students **label** their containers with their names and identifiers for their experiment i.e. type of soil. Masking tape is an easy way to label them.
  - Students add **soil** to their containers. Students should put the same amount of soil in each container unless that is what they are testing.
  - Students place **seeds** in a hole as deep as the seed is wide.
  - Students **water** plants. Students should determine an amount and frequency of watering as part of their experiment.
- Plants should all be located in the same area in the classroom. As best as possible, you want the experiments to only focus on the 1 variable the students are intentionally changing. Keeping the plants in the same area helps eliminate variables in sunlight and temperature.
- Radish seeds are a good choice to plant as they grow quickly, connections to other lessons can be made, and they can be eaten. Radishes are ready to harvest in about 3 weeks. *More background information on growing radishes.*
- Have students work in their small groups to **collect data regularly** using the ***s*** until the end of the ecosystem/plants unit. Students should record measurements of the plant's height, number of leaves, and other observations.
  - Have students use Part 1 of the data sheet to record their experiment parameters and daily observations of their plant's growth.
  - Have students use *A Seed's Journey* part of the data sheet to write a story about their seed. This activity could be worked on daily or during a class one day after the plant has begun to grow.

Assessment

- *A Seed's Journey* writing assignment can be graded. Part 1 of the data sheet will be used in Part 2 of the learning activity and the data sheets from both parts can be graded together.

Opportunities for Extended Learning

1. Students learn about various plants found in different habitats using the *Plant Habitats* section of the Plants module in Pebble Go.
   - Which habitats are found at school? In North Carolina?

Behavior & Materials Management Tips

- Before students are allowed to collect materials, have them determine their jobs, i.e. measures soil, counts seeds, records data.

Name: _____ Group members: _____

From a Seed to a Plant: Part 1

Date seeds planted: _____ **Type of seeds planted:** _____

1. What is your experiment?

My group will be testing _____

My group will keep the same _____

2. Make a prediction about how your plants will grow in your experiment.

We think _____

because_____

3. How did your seeds change in the first week?

_____

From a Seed to a Plant Observation Log

Day	How tall?	How many leaves?	Observations
Day 1	Seeds all = _____		All seeds _____
Day	Plant 1 = _____ Plant 2 = _____	Plant 1 = _____ Plant 2 = _____	
Day	Plant 1 = _____ Plant 2 = _____	Plant 1 = _____ Plant 2 = _____	
Day	Plant 1 = _____ Plant 2 = _____	Plant 1 = _____ Plant 2 = _____	
Day	Plant 1 = _____ Plant 2 = _____	Plant 1 = _____ Plant 2 = _____	

Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	
Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	
Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	
Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	
Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	
Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	
Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	
Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	
Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	
Day	Plant 1 = _________ Plant 2 = _________	Plant 1 = _________ Plant 2 = _________	

Name: _____

A Seed's Journey

What would life be like as a seed? You have planted seeds and will watch them grow. Create a story of the life of one of your seeds and plants using the below sentence starters.

Finally, I have found a new home! I have been planted by _____ in _____. I heard the students talking about how I will become _____. On my second day, water has changed me by _____. Each day I keep growing and changing. I predict I will be _____ cm tall. Three adjectives that describe how I look as a seedling are _____, _____, and _____. I think I will have _____ number of leaves that are _____ and _____. As I continue to grow, my roots are _____, and my stem is _____. Under the soil I am _____ _____. Growing seems so slow because _____ _____. I knew that water would help me grow, but I am surprised that _____. Compared to the seed I started as, I am now _____. As a plant, my purpose in life is to _____. After _____ days, you could describe me as _____, _____, and _____.

Arc 2 – Plant Structures & Life

Essential Questions

How do the systems and structures of plants function to support life?

NC Science Essential Standards – Unpacked Content

3.L.2.1 Students know the names and functions of major plant parts (roots, leaves, stems, flowers). Students know that plants have special parts that perform special functions in order for the plant to survive.

3.L.2.3 Students know the distinct stages of the life cycle of seed plants (seed, germination, seedling, adult).

Lessons in this Arc

- ❖ Learning Activity 5: Plants and Their Parts
- ❖ Learning Activity 6: Down Under
- ❖ Learning Activity 7: Looking at Leaves
- ❖ Learning Activity 8: Flower Power
- ❖ Learning Activity 9: Sizing Up Seeds
- ❖ Learning Activity 10: Plant Life Cycle
- ❖ Learning Activity 11: Tree Lifecycle

Go Outdoors!

- ✓ Learning Activity 5: Plants and Their Parts
- ✓ Learning Activity 6: Down Under
- ✓ Learning Activity 7: Looking at Leaves
- ✓ Learning Activity 8: Flower Power
- ✓ Learning Activity 11: Tree Lifecycle

Nature Journal Connection

- ▪ Learning Activity 7: Looking at Leaves
- ▪ Learning Activity 8: Flower Power
- ▪ Learning Activity 11: Tree Lifecycle

Duration

10 days of 30 minute learning activities

Background Information

A **plant** is a living thing that makes its own food using sunlight. It is unable to move and remains stationary in the ground. Plants have specific structures that allow them to survive. From the ground up, roots, stems, leaves, and flowers are responsible for the growth of the plant. The structures have different **functions** or purposes. The **root** of the plant is underground and anchors the plant in the ground. The roots absorb nutrients and water from the soil. The **stem** of the plant grows out of the ground and provides support for the leaves and flowers. The stem contains the xylem and phloem which transports nutrients, food, and water throughout the plant. The **leaves**

grow off the stem or twig and is where photosynthesis occurs. Chlorophyll found in leaves is essential to the process of photosynthesis and gives leaves their green color. **Photosynthesis** is the process plants use to combine water, sunlight, and carbon dioxide to make food. The flat shape of leaves allows them to absorb more sunlight**.** A product of photosynthesis is the oxygen we breathe. The **flower** of the plant consists of petals and the reproductive parts. The flower becomes the fruit which contains the seeds enabling the plant to reproduce. The **fruit** is the ripened ovary of a seed plant which holds the new seeds required for reproduction. **Seeds** allow a new plant to grow. **Seedlings** are young plants that originated from the seed.

Seed plants have distinct life cycles beginning with the seed. After being in the soil for a few days, the seed will begin to **germinate**. This is when the plant beings to grow or sprout. In order for the seed to germinate it needs specific nutrient and water requirements. After germination, the seed will continue to grow into a seedling and begin growing leaves. The leaves allow the plant to use photosynthesis to create food for energy to be able to continue to grow. The flowering plants (angiosperms) will produce a flower allowing the plant to begin the process reproduction. **Pollination** is part of the reproduction process and occurs when pollen is transferred from the male part (anther) of one plant to the female part (stigma) of that plant. In conifers (gymnosperms), instead of flowers, cones will be produced with male cones producing pollen that fertilize the ovulate cones through pollination. It can also occur between two different plants of the same kind. Birds, insects, water, air, or other pollinators will carry the pollen from the anther to the stigma. The fertilized eggs in the female plant ovary will then become seeds. If the plant is fruit producing, the ovary ripens and will become a fruit. The seeds then develop into new plants continuing the life cycle. Not all plants produce seeds for reproduction, such as mosses and ferns, which instead reproduce through spores.

To allow seedlings to have enough room to grow, plants have various methods of seed dispersal to help move the seeds away from the parent plant and each other. Seed dispersal methods are often grouped into wind, water, and animals. Seeds and their coverings are designed for their dispersal method. Seeds that disperse by wind are often light and fluffy like a dandelion seed or shaped to be carried by the wind like the maple samara. Some seeds are designed to float in water, such as the coconut. Animals can transport seeds both externally and internally. Seeds may stick to animal fur or feathers. Velcro was designed to mimic the hook and loop structure of burdock seeds which attach themselves to passing animals. In particular, seeds encased in fruit are designed to survive traveling through an animal's digestive system.

Vocabulary

- **Flower** is a specialized plant part usually made up of petals and the reproductive parts of a plant which become the seeds and the fruit.
- **Fruit** is the ripened ovary of a seed plant which contains the seeds of the plant.
- **Function** is the purpose of a certain part of a living thing.
- **Germinate** is when a plant begins to grow or sprout.
- **Leaf** is a flat, green plant part growing from a stem or twig which is where photosynthesis takes place.
- **Photosynthesis** is the process by which green plants use sunlight, carbon dioxide, and water to make food.
- **Plant** is a living thing that makes its own food and cannot move.
- **Pollination** is when pollen is transferred from the male part (anther) of one plant to the female part (stigma) of that plant or another plant of the same kind.
- **Root** is the bottom part of the plant that grows underground.
- **Seed** is the part of a plant from which a new plant can grow.
- **Seedling** is a young plant grown up from a seed.
- **Stem** is the main part of the plant that supports the leaves and flowers.

Literature Connections

Books

- *Roots* by Vijaya Bodach (580 BOD)*
- *What Do Roots Do?* by Kathleen Kudlinski
- *The Reason for a Flower* by Ruth Heller
- *Planting a Rainbow* by Lois Ehlert (E EHL)*
- *Flip, Float, Fly: Seeds on the Move* by Joann Early Macken
- *A Seed is Sleepy* by Dianna Hutts Aston and Sylvia Long (581.4 AST)*
- *Seeds* by Vijaya Bodach (580 BOD)*

Book sets

- *Plant Life Cycles* by Anita Ganeri*
- *From Seed to Sunflower* by Anita Ganeri*
- *From Seed to Apple* by Anita Ganeri*
- *From Bean to Bean Plant* by Anita Ganeri*

*currently available in Northside Elementary's media center

Learning Activity 5
Plants & Their Parts

Lesson Prep

- ✓ Make copies of the *Plants and Their Parts* graphic organizer for each student.
- ✓ Familiarize yourself with the PebbleGo *Plants* module.

Vocabulary

Plant, leaf, root, stem, seed, seedling, flower, fruit, function, photosynthesis, pollination, germinate

Procedure

Mini-Lesson

- Introduce the word "**function**".
- Give several examples of the function of different objects, such as a pencil, a clock, and a bus.
- Ask students to define the term "function".
- Improve and refine the definition by having a few students share.
- Write the final definition on the board.
- **Explain** that today students will be learning about plants, their parts, and the function of those parts.

Independent Work

- Students will use PebbleGo to learn some of the plant unit **vocabulary**.
- Have students go to PebbleGo -> Science -> Living Things -> *Plants*
- Instruct students to go through all the parts of "What Are Plants?", "Plant Classification", and "Plant Parts" within the Plants module.
- As they navigate through the module, have them complete the *Plants and Their Parts* graphic organizer.

Learning Objectives:
Define plant vocabulary terms.

Nutshell/Skill:
Students use the text to answer questions and define terms.

Science Essential Standards:
3.L.2.1

ELA Essential Standards:
RI.3.1, RL.3.4

Time:
30 minutes

Teacher Materials:
- *Plants and Their Parts* graphic organizer answer key

Student Materials:
- Chromebooks or iPads
- Headphones
- PebbleGo *Plants* module
- PebbleGo login
- *Plants and Their Parts* graphic organizer

Assessment

- Use the *Plants and Their Parts* graphic organizer answer key to grade their graphic organizers.
- Once graded, give students an opportunity to correct their papers as it contains many key vocabulary words and their definitions.

Opportunities for Extended Learning

1. Take the class outside to an area with plants.
2. Have students turn and talk to a partner about each part of a plant.
3. Each student should have a chance to talk about each part of a plant and its function. Have students point at or gently touch each part as they are talking, i.e. "Where are the roots of the plant?".
4. Remind students to be gentle with the plants and to leave the plants the way they found them.

Name _____

Plants and Their Parts

Directions: Login to PebbleGo. Click on Science -> Life Sciences -> Plants to complete the below sentences.

What Are Plants?

1. Plants are _____, _____, and _____.
2. Plants need _____, _____, _____, and _____.
3. Nutrients are _____.
4. Most plants have three main parts: _____, _____, and _____.
5. A leaf is _____.
6. A root is _____.

7. A stem is _____.
8. A seed is _____.

Plant Classification

9. Conifers are _____.
10. A cone is _____.
11. A seedling is _____.

12. A fern is a plant _____

_____.

13. A spore is _____.

14. A flower is _____

_____.

15. The fruit is _____

_____.

16. Pollination is when pollen _____ by wind or animals. Then fruit and seeds form.

17. Germination is when a _____ sprouts and a _____ grows.

18. Moss is _____.

Plant Parts

19. Petals are _____.

20. Nectar is _____.

21. Examples of flowers that we eat include _____ and _____.

22. _____ protect _____ until they start to grow.

23. Seeds are spread by _____, _____, and _____.

24. We eat fruits, like _____, _____, and _____, as well as seeds, like _____.

25. The function of a leaf is to _____.

26. Photosynthesis is how plants use _____, _____, and _____ to make their own food.

27. Some leaves that we eat are _____, _____, and _____.

28. One job of a plant's roots is to _____.

29. We eat roots, such as _____, _____, and _____.

30. A trunk is _____.

Name ANSWER KEY

Plants and Their Parts

Login to PebbleGo. Click on Science -> Life Sciences -> Plants to complete the below sentences.

What Are Plants?

1. Plants are **living things**, **made of many cells**, and **cannot move around**.
2. Plants need **sunlight**, **air**, **water**, and **nutrients**.
3. Nutrients are **a substance a living thing needs to stay healthy**.
4. Most plants have three main parts: **leaves**, **roots**, and **stems**.
5. A leaf is **the flat and usually green part of a plant that grows out**.
6. A root is **the part of the plant that is underground**.

7. A stem is **the long main part of a plant from which the leaves and flowers grow**.
8. A seed is **the part of a plant that can grow into another plant**.

Plant Classification

9. Conifers are **an evergreen tree that produces cones**.
10. A cone is **the hard, woody fruit of a pine or fir tree**.
11. A seedling is **a young plant that has been grown from a seed**.
12. A fern is a plant **a plant with feathery leaves, or fronds, and no flowers that usually grows in damp places.**

13. A spore is ____a way that some plants reproduce; does not have food for the young plant_____.

14. A flower is _____the colorful part of a plant that makes fruit and seeds_____.

15. The fruit is ___the fleshy, juicy part of a plant that contains seeds and usually can be eaten_____

_____.

16. Pollination is when pollen _____is carried to other flowers_____ by wind or animals. Then fruit and seeds form.

17. Germination is when a __seed____ sprouts and a _____seedling_____ grows.

18. Moss is _____a soft, short plant with no roots; moss grows on damp soil, rocks, and tree trunks_.

Plant Parts

19. Petals are _____ one of the colored outer parts of a flower _____.

20. Nectar is ____a sweet liquid found in many flowers_____.

21. Examples of flowers that we eat include ____artichokes_____ and _____cauliflower_____.

22. ____Fruits_____ protect _____seeds_____ until they start to grow.

23. Seeds are spread by __wind_____, _____water_____, and _____animals_____.

24. We eat fruits, like _____apples_____, _____pears_____, and ___oranges_____, as well as seeds, like _____peas OR sunflower_____.

25. The function of a leaf is to _____make food_____.

26. Photosynthesis is how plants use _____sunlight_____, _____air_____, and ____water_____ to make their own food.

27. Some leaves that we eat are ____lettuce____, _____basil____, and __parsley (OR cabbage OR spinach)__.

28. One job of a plant's roots is to __hold it in place and keep it from falling over OR store food OR soak up water and nutrients_____.

29. We eat roots, such as _____carrots_____, ____sweet potatoes_____, and ____radishes OR turnips_____.

30. A trunk is ___the thick, woody stem of a tree_____.

Learning Activity 6
Down Under

Adapted from the activity *Down Under* from *The Budding Botanist: Investigations with Plants* by the AIMS Education Foundation

Lesson Prep

- ✓ Review the activity *Down Under* from *The Budding Botanist* (p. 86-91). A copy of *The Budding Botanist* can be found in the professional collection of the Northside Elementary Media Center.
- ✓ Determine if you want to use the provided text in *The Budding Botanist* or the book *Roots* to introduce roots to the students.
- ✓ Make copies of the graphic organizer on p. 90.
- ✓ Identify a location to take students to observe and remove weeds.
- ✓ Identify and gather best available tools to use for weed removal.

Learning Objectives:
Observe the root system of a plant and compare it with the growth above ground.

Nutshell/Skill:
Students can describe the root system of a plant.

Science Essential Standards:
3.L.2.1

ELA Essential Standards:
SL.3.1

Math Essential Standards:
NC.3.MD.2

Time:
30 minutes

Teacher Materials:
- *Down Under* from *The Budding Botanist: Investigations with Plants* by the AIMS Education Foundation (p. 86-91)
- *Roots* by Vijaya Bodach (optional)

Student Materials:
- Digging tools
- Rulers
- Private Eyes (or other magnifiers)
- Copies of graphic organizer

Vocabulary

Root

Procedure

Complete Part One of *Down Under* from *The Budding Botanist: Investigations with Plants* by the AIMS Education Foundation (p. 86-91).

Mini-Lesson

- Use the text on p. 86 or *Roots* by Vijaya Bodach (580 BOD) to introduce root types and purposes.

Independent Work 

- Take the class outside to find a weed to observe.
- You may choose to have students work in small groups, in particular if the number of weeds is limited.
- Using shovels or other digging tools have students carefully dig up a weed, including the roots.
- Students will complete the graphic organizer which includes sketching and measuring the plant.

Assessment

- Discuss the questions on p. 91 to formatively assess the students.
- Students could first discuss with partners or in small groups before participating in a class discussion.

Opportunities for Extended Learning

1. If the class grows radishes or other root vegetable, complete Part Two of *Down Under.*

Behavior & Materials Management Tips

- ♦ Model and describe proper tool use for observing and removing weeds. In particular, discuss applicable safety issues with digging tools.

Learning Activity 7
Looking at Leaves

Lesson Prep

- ✓ Identify the species of a few trees in the schoolyard.
- ✓ Determine which field guides students will be using and familiarize yourself with them.
- ✓ Make copies of the nature journaling prompt for students if preferred.
- ✓ Preview the video on leaves.

Vocabulary

Leaf, photosynthesis

Procedure Part 1:

Independent Work

- Take your class outside for students to **observe leaves**.
- Students will describe, draw, compare, and contrast leaves in their nature journals.
- Instruct students to **observe leaves** where they find them, whether on the ground or on a plant. Students do not need to remove the leaf from the plant for this assignment.
- **Nature Journaling Prompt**:
  - **Describe** your leaf. What does it look like? What does it feel like? What shape is it? What does the edge of the leaf look like?
  - **Sketch** your leaf. Be sure to include the veins of the leaf. Are the veins parallel? Do they radiate out from a central point?
- Have students choose a second leaf to compare to their first leaf. At least one of their 2 leaves needs to be a leaf from a tree.
- **Nature Journaling Prompt**:
  - How are the leaves **different**? List at least **3** differences.
  - How are the leaves the **same**? List at least **2** ways the leaves are the same.
  - What is the **function** of a leaf?
- Nature journaling prompts are on a separate page at the end of this lesson to allow you to print them out for students if preferred.

Mini-Lesson

- Discuss the leaves students examined, and the function of leaves.
- Bring a few leaves inside with you to use during your discussion, or you can use pictures such as the ones at the end of this lesson.
- Show a video on photosynthesis to connect back to the function of leaves - *"Photosynthesis" by They Might Be Giants* (1:58).

Learning Objectives:
Observe how leaves from different plants compare.

Nutshell/Skill:
Students can describe and identify leaves.

Science Essential Standards:
3.L.2.1

ELA Essential Standards:
RI.3.5

Time:
Part 1: 30 minutes
Part 2: 30 minutes

Teacher Materials:
- *Video on photosynthesis* by *They Might Be Giants*

Student Materials:
- Tree field guides
- Nature Journals
- Private Eyes (or other magnifiers)
- Colored pencils

Procedure Part 2:

Independent Group Work

- Have students go outdoors to look at leaves to **identify** the species of a tree. They can use books or online field guides, such as:
  - *Common Forest Trees of North Carolina* from the North Carolina Forest Service
  - *"What Tree is That?"* online tree identification guide from the Arbor Day Foundation
- **Before** going outside, introduce the tree identification guides you will be using and how to use them. If using books, show them how the trees are grouped. Show them the table of contents and the index.
- Choose trees for students to investigate that you have previously identified.
- Some common trees you may find on your school grounds are:
  - Black Oak
  - Flowering Dogwood
  - Redbud
  - Red Maple
  - River Birch
  - Southern Magnolia
  - Sourwood
  - Sweetgum
  - Sycamore
  - Tuliptree (Yellow Poplar)
  - White Oak
  - Willow Oak
- Give students a short list of possible trees, including the correct one, for them to look up.
- Have students work in groups of 3-5 people.
- Assign a group per tree.
- Rotate between groups to assist with identifying the trees.
- Once students have identified the trees, have each group **share** their tree's identity and where they found the information. Also, have students share a fact they learned about their tree.

Assessment

- **Exit ticket:** What is the function of a leaf?

Opportunities for Extended Learning

1. To go more in-depth on leaves, watch Mystery Doug's video on *"Why do leaves change color in the fall?"* (5:25).

Behavior Management Tips

- Before going outside, have a brief discussion about how to behave respectfully toward plants and nature. In particular, discuss how they can observe leaves without removing them from the plants or otherwise hurting the plants. Ask students for their ideas.
- For the nature journaling prompts, emphasis that students are honing their observation skills and should be looking at the details. Give them a timeframe of how long they will be working on each prompt. Announcing how much time they have left can help clarify that expectation.
- Set expectations of interaction and talking amongst each other for nature journaling. For example, tell students to stay silent and focused on their own leaves as well as that they will be given a chance to discuss the leaves later.
- To help students stay focused, make identifying the trees into a challenge. For instance, you could have a time limit or a challenge to be the first to correctly id their tree.

Leaves Nature Journaling Prompt 1:

1. **Describe** your leaf. What does it look like? What does it feel like? What shape is it? What does the edge of the leaf look like?
2. **Sketch** your leaf. Be sure to include the veins of the leaf. Are the veins parallel?

Leaves Nature Journaling Prompt 2:

- How are the leaves **different**? List at least **3** differences.
- How are the leaves the **same**? List at least **2** ways the leaves are the same.
- What is the **function** of a leaf?

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- How are the leaves the **same**? List at least **2** ways the leaves are the same.
- What is the **function** of a leaf?

Learning Activity 8
Flower Power

Lesson Prep

- ✓ Buy flowers, such as *Alstroemeria*.
- ✓ Review the *Flower Power* slideshow.
- ✓ Print slide number 6 showing a labeled diagram of a flower. Make half sheet sized copies to give to pairs of students.
- ✓ Make copies of the *Flower Dissection* worksheet, 1 per student.

Vocabulary

Flower, pollination

Procedure Part 1

Mini-Lesson

- Use the *slideshow* to teach basic parts of a flower and their corresponding functions.
- Start by discussing the question "What is the job of the flower of the plant?" found on the first slide. Have students turn and talk to a partner before calling on a student. Elaborate on the answer as needed using the next slide.
- Read through each slide which give details about the parts of a flower.
- Bring it all back to the **function** of flower with slide 7 showing the pink lily before giving instructions for flower dissection. Ask students to name the parts of the flower. Flip between slides 6 and 7 as needed.

Independent Group Work

- Each student will receive a flower to draw and then dissect.
- Go over the worksheet. **Emphasize to students that they must draw their flower before dissecting it.**
- Using a document camera, **model** dissecting (pulling apart with your hands) from the outside of the flower (sepals and petals) to the middle (carpel).
- **Model** how students will tape the parts of a flower in the corresponding boxes on the Flower Dissection worksheet (at the end of the lesson).
- Ask the students what they noticed about what you modeled. If a student doesn't, point out that you used one piece of tape to attach the flower part to the paper.

Learning Objectives:
Recognize flowers are made of parts that help it attract pollinators and make seeds.

Nutshell/Skill:
Students will identify the parts of a flower by dissecting a real flower, completing a diagram, and then comparing it to a real flower in the school garden.

Science Essential Standards:
3.L.2.1

ELA Essential Standards:
W.3.2

Time:
Part 1: 30 minutes
Part 2: 30 minutes

Teacher Materials:
- *Flower Power* slideshow
- Scissors for cutting off flowers

Student Materials:
- Flowers, 1 per student (*Alstroemeria* work well)
- Private Eyes or hand lenses
- Copy of labeled flower diagram per pair (laminated) (in slideshow)
- Copy of worksheet per student
- Colored pencils
- Pencils
- Transparent tape
- Optional – small paper plates for dissecting flowers

- Before passing out the worksheet, ask students what to do after they write their name on their paper to confirm they know to draw their flowers **before** dissecting.
- Have students help pass out materials while you cut off individual flowers. If your schedule allows, you can precut individual flowers, but they will wilt the longer they are off the stem and out of water.
- Monitor and assist students as needed. As you circulate, confirm students are labeling their diagram correctly and placing flower parts in their corresponding boxes.
- Have cards with higher order questions ready for students to think about and discuss as they finish.
- Have students clean up. A sample clean up slide is included. Make a detailed clean up slide with pictures showing how you want your students to clean up and where you want items put away.
- Ask for volunteers to show their drawing, explain the function of the parts, and show their dissected flower. Students can place their worksheet under the document camera to show their work.
- **Discuss** the higher order questions as a class.
- You can use slide 10 about the different types of plants, including flowering plants to talk about different types of flowers.

Assessment

- As you circulate while students are dissecting flowers, formatively assess their knowledge of flowers. Additionally, you can use the class discussion of the higher order questions as a formative assessment.

Procedure Part 2

Independent Work

- Take the students outside to observe flowers in bloom around the school.
- **Nature Journal Prompt:**

  - Sketch and label a flower in your nature journals.
  - Compare the flowers you see with the ones you dissected. How is this flower the same as the flower you dissected? How is this flower different?

Opportunities for Extended Learning

1. Read a book about flowers and gardening. Many good choices are listed on the main page for this Arc, such as *The Reason for a Flower* by Ruth Heller and *Planting a Rainbow* by Lois Ehlert (E EHL).
2. Have a *coloring sheet* of a labeled flower for students to complete as they finish their dissection.
3. Watch the SciShow Kids video "*Look Inside a Flower!*" (4:13). (You can slow down the playback speed in the settings for the video.)
4. Watch the Mystery Doug video "*How do flowers bloom in the spring?*" (5:14).

Behavior & Materials Management Tips

- Students don't need anything to dissect a flower other than their hands. Tools, such as toothpicks and probes, are not necessary for this activity and, therefore, are more likely to be misused.

Name _____

Flower Dissection

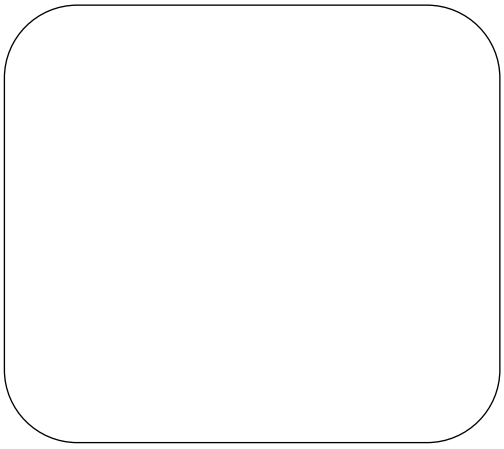
1. Draw your flower. Label ALL the parts:
Sepal, petal, stem, carpel, stigma, style, ovary, ovule, stamen, anther, filament

2. What is the function of a flower?

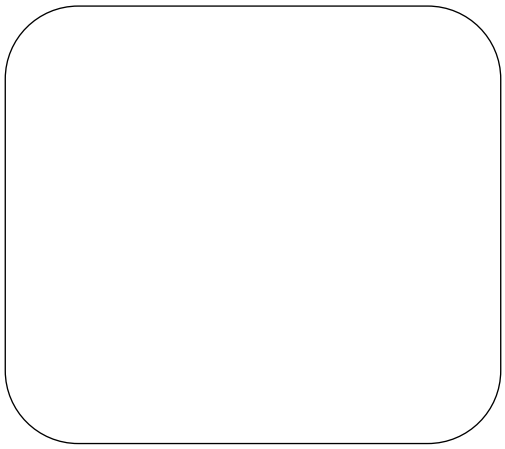
_____

_____

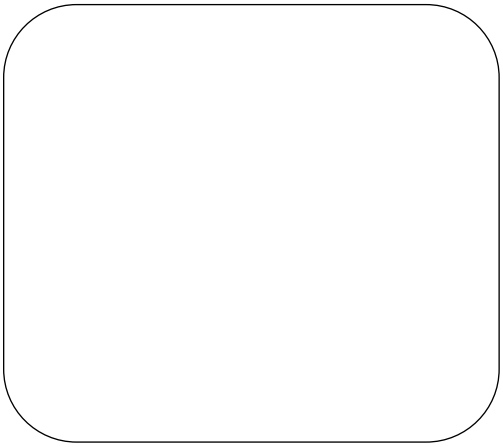
3. Dissect, or take apart, your flower. Tape the parts in the correct boxes.



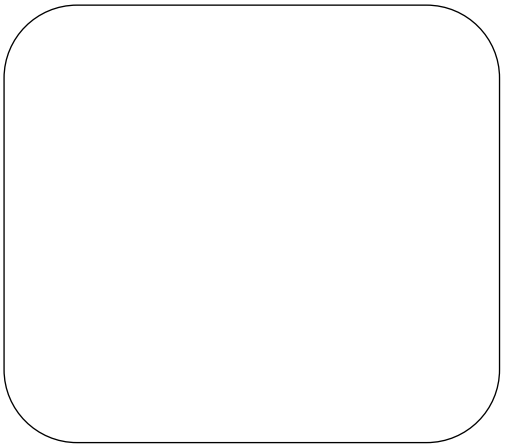
a. Petal



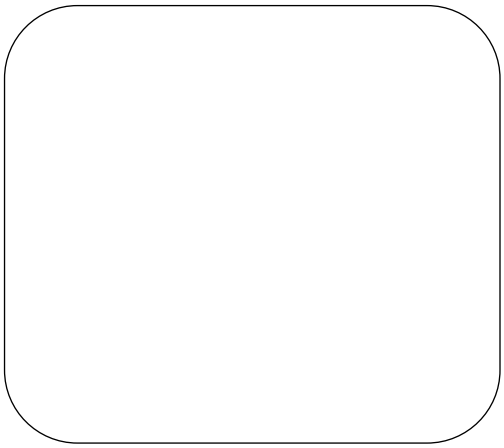
b. Stamen



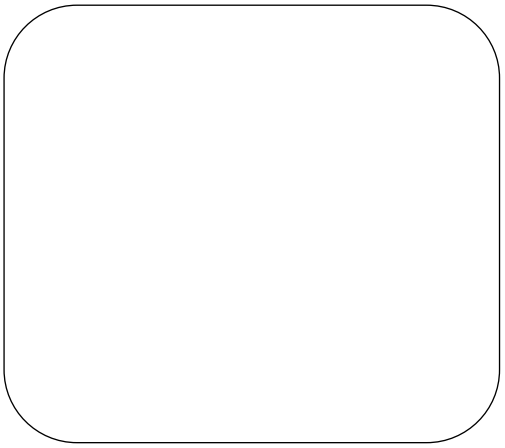
c. Pollen



d. Carpel



e. Ovary



f. Ovule

Higher order questions that can be made into cards to hand to students who finish early.

Why do flowers have pollen?

What does the ovary do?

Describe pollination.

What does the anther do?

Why do flowers have petals?

Why don't all plants flowers?

What is the function of the stigma?

Describe a plant without flowers.

How would cutting all the flowers off a plant affect it?

What is the purpose of the petals?

List some pollinators.

Learning Activity 9
Sizing Up Seeds

Lesson Prep

- ✓ Obtain a copy of the book about seeds you will read to the class.
- ✓ Collect a variety of seeds, preferably from your schoolyard.
- ✓ Determine how seeds will be handled during lesson, i.e. what they will be in and where.
- ✓ Make a copy of *Sizing Up Seeds* graphic organizer for each student.

Vocabulary

Seed

Procedure

Mini-Lesson

- **Read** *Flip, Float, Fly: Seeds on the Move* by Joann Early Macken, *A Seed is Sleepy* by Dianna Hutts Aston and Sylvia Long, or another book on seeds.
- **Discuss** the importance of seeds and the term dispersal (how seeds move) as you read the book.
- Prompt students to make connections between how a seed looks and how it moves. For example, fluffy dandelion seeds are designed to be moved by the wind.

Independent Work

- Have students complete the *Sizing Up Seeds* graphic organizer as they observe various seeds.
- **Model** how they will be drawing the seed without and then with magnification.
- **Explain** that they will be observing and drawing **4 different seeds**.
- Remind them to also answer the questions about the **dispersal** and the **function** of seeds after their observations.

Assessment

- After collecting the graphic organizers, ask students to share about a few different seeds and how they are dispersed as a method of formative assessment. Also have students tell you what the function of a seed is.
- Grade their *Sizing Up Seeds* graphic organizer for completeness overall and for accuracy on their answer to what is the function of seeds.
    - Remember the function of a seed is to produce more plants as a new plant grows from a seed.

Learning Objectives:
Observe a variety of seeds and recognize how they disperse.

Nutshell/Skill:
Through observing the characteristics of seeds, students can identify dispersal methods.

Science Essential Standards:
3.L.2.1

ELA Essential Standards:
W.3.2, W.3.3, SL.3.1, SL.3.4 (all in extensions)

Time:
30 minutes

Teacher Materials:
- *Flip, Float, Fly: Seeds on the Move* by Joann Early Macken or *A Seed is Sleepy* by Dianna Hutts Aston and Sylvia Long (581.4 AST) (or other seed related book)

Student Materials:
- Private Eyes
- Various seeds (preferably collected from school grounds)
- Petri dishes, small paper plates, or other containers for seeds
- Colored pencils
- *Sizing Up Seeds* graphic organizer

Opportunities for Extended Learning

1. Have students design and create a seed.
    - Students will need to think like a plant and an engineer to determine the shape and materials of their seed for it to move in the way that is best for their plant.
    - Have students share their seeds and describe how their seed moves.
    - Students could work in pairs or small groups.
2. Connect seeds to what people eat through a discussion and writing assignment.
    - Ask students for examples of seeds that we eat (or foods made from seeds), such as sunflower seeds, peas, beans, corn, rice, oats, wheat, sesame seeds, peanuts, pecans, almonds, and walnuts. You could show students pictures of some examples, such as the page of pictures at the end of this lesson.
    - Have students write about their favorite seeds to eat or which seeds they have eaten in the last week.
    - The assignment could include having students write about what other animals, like birds and squirrels, might eat the same types of seeds.
    - This could be done as a **Nature Journaling Prompt** in the garden. 

Behavior & Materials Management Tips

- Place a container of various seeds on **each table** for students to share **OR** have a **central location** where students can come to get one seed at a time.
- Describe how they will be sharing the seeds or collecting 4 at the beginning of the activity.
- Give clear instructions about if students are allowed to break open seeds and seed holders in their explorations.
- Have a plan for collecting the seeds at the end of the lesson. Consider having one student from each table collect the seeds and return them to a central location.

Name: _____ Date _____

Sizing Up Seeds

Observe the seeds and seed holders. Choose 4 to draw. Use The Private Eye or other magnifier.

1.  Draw what you see.  Draw what you see under magnification.

How is this seed dispersed? Circle your answer.

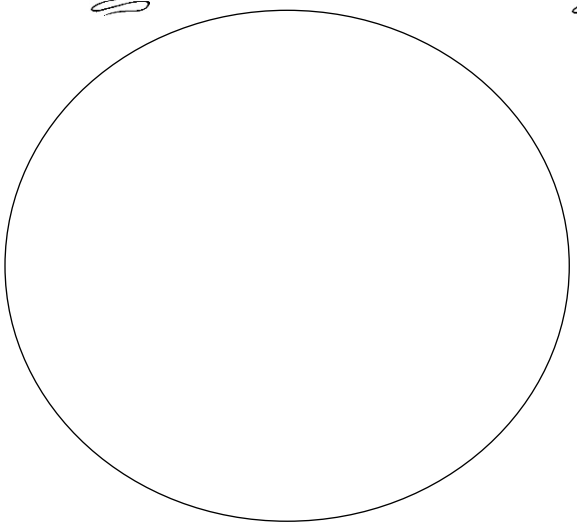
Wind Animal Water Bursting

2.  Draw what you see.  Draw what you see under magnification.

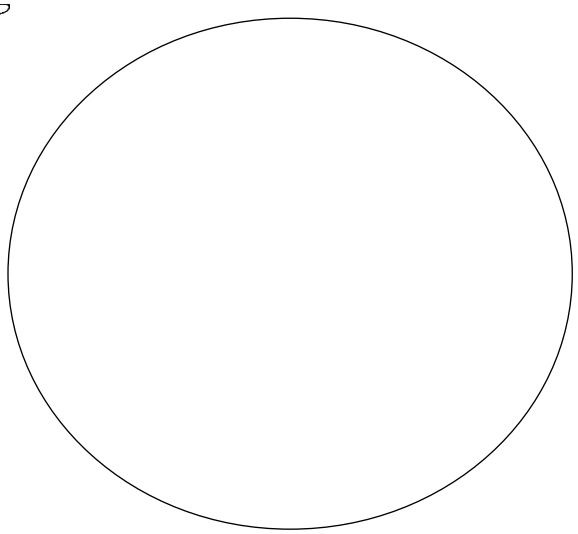
How is this seed dispersed? Circle your answer.

Wind Animal Water Bursting

3. Draw what you see.



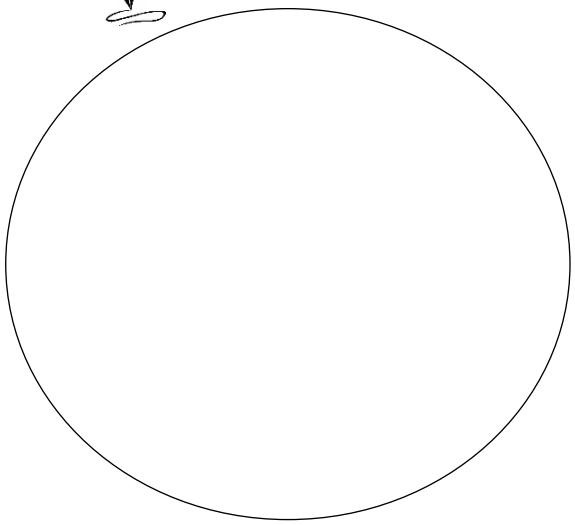
Draw what you see under magnification.



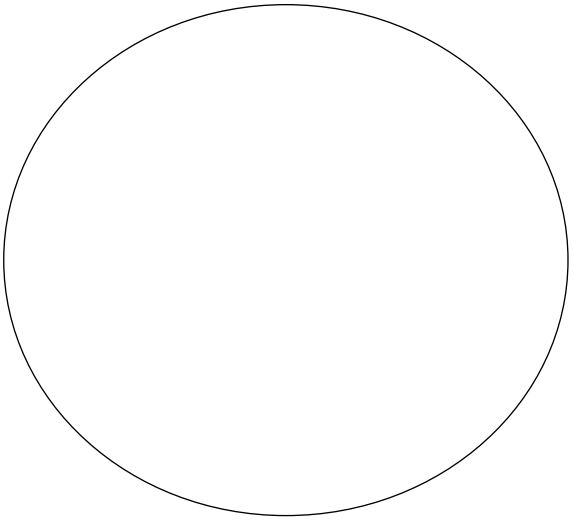
How is this seed dispersed? Circle your answer.

Wind Animal Water Bursting

4. Draw what you see.



Draw what you see under magnification.



How is this seed dispersed? Circle your answer.

Wind Animal Water Bursting

5. What is the function of a seed?

Seeds We Eat


pecans


walnuts


sunflower seeds


peas


beans


rice

Learning Activity 10
Plant Life Cycle

Lesson Prep

- ✓ Preview the plant life cycle video.
- ✓ Become familiar with the concept mapping app of your choosing. Popplet has a *demo on their website*.
- ✓ Gather books on plant life cycles, such as those listed in the student materials, for students to use to create a mind map.

Vocabulary

Plant, leaf, root, stem, seed, seedling, flower, fruit, function, photosynthesis, pollination, germinate

Procedure

Mini-Lesson

- Show a video, such as SciShow Kids "*How does a seed become a plant?*" video (3:46), or another video showing the life cycle of a plant. (You can change the playback speed in settings on the video.)

Guided Practice

- Have the students **move** their bodies through the plant life cycle.
  - Students begin crouched down on the floor as a seed.
  - Ask the students what a seed needs to grow **- sunlight, water, air/carbon dioxide, nutrients/soil.**
  - Have students stretch out a leg to represent a root growing from the seed.
  - Have students reach an arm up to represent a seedling growing up through the soil.
  - Have the students very slowly stand up as they grow as a plant.
  - Reinforce that the plant is receiving sunlight, water, air, and nutrients as it grows.
  - Have students reach their arms out to represent leaves.
  - Have students smile big to represent a flower growing.

Learning Objectives:
Explain the steps in a flowering plant's life cycle.

Nutshell/Skill:
Students can describe the life cycle of a plant.

Science Essential Standards:
3.L.2.3

ELA Essential Standards:
RI.3.5, W.3.2

Time:
30 minutes

Teacher Materials:
- SciShow Kids *"How does a seed become a plant?"* video

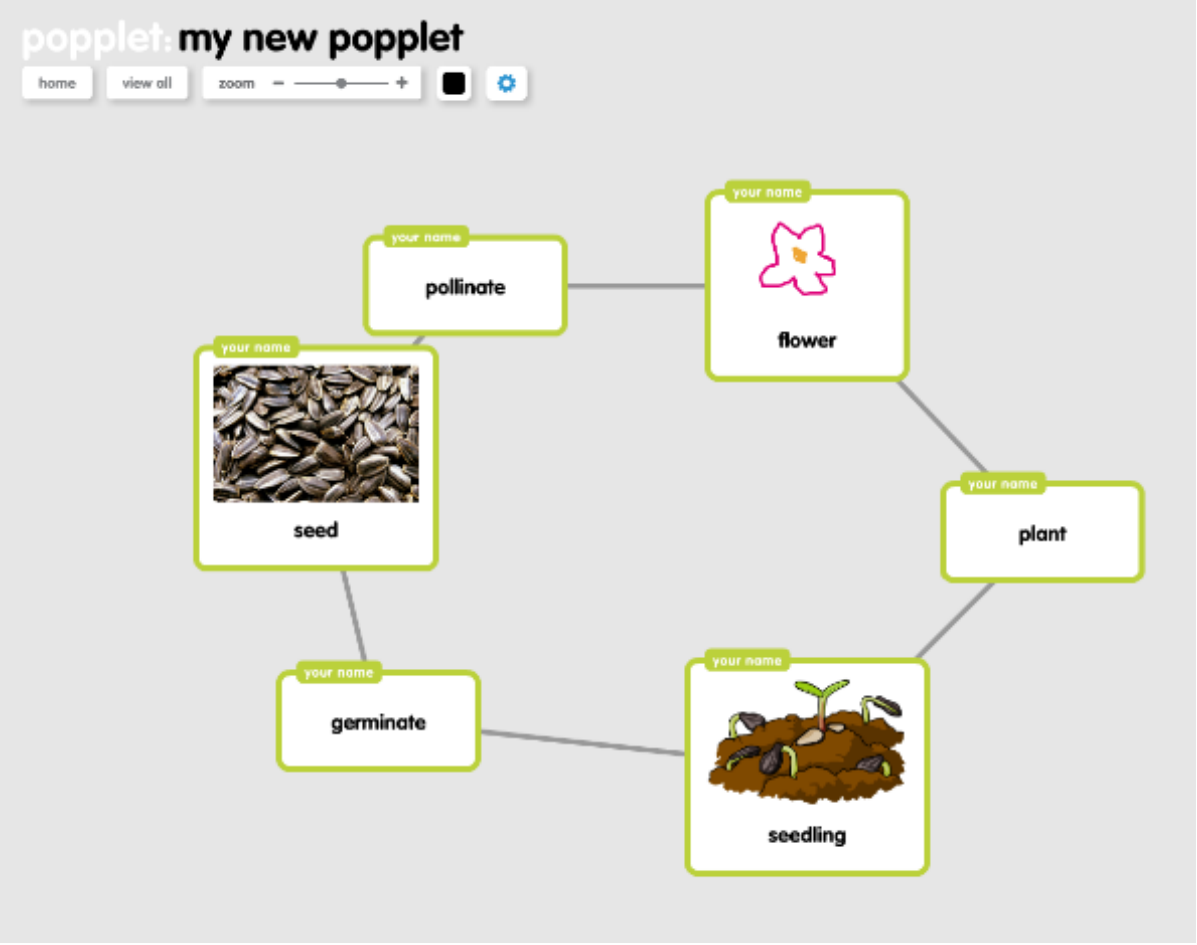
Student Materials:
- iPads (or Chromebooks)
- Popplet or other mind map app
- One of more of the following book sets by Anita Ganeri:
  - *Plant Life Cycles*
  - *From Seed to Sunflower*
  - *From Seed to Apple*
  - *From Bean to Bean Plant*

Independent Work

- Have students use an app, such as Popplet, to create a **mind map** of the plant life cycle. (see example below)
- Give **specific** parameters, such as students must use at least 6 vocabulary words and include 3 pictures in their map.
- Provide books on plant life cycles, such as *Plant Life Cycles* by Anita Ganeri, *From Seed to Sunflower* by Anita Ganeri, *From Seed to Apple* by Anita Ganeri, and *From Bean to Bean Plant* by Anita Ganeri, for students to use as a resource.
- After showing you their mind map, students can watch "*Seed Plants*" on BrainPop.

Assessment

- Formatively assess student's knowledge of the vocabulary and plant life cycle by looking at students' mind maps once they are complete.



Learning Activity 11
Tree Lifecycle

This activity adapted with permission from Activity 79 *Tree Lifecycle* in the *Project Learning Tree PreK-8 Environmental Education Activity Guide*.

Lesson Prep

- ✓ Read Activity 79 *Tree Lifecycle* in *Project Learning Tree*. A full copy of the *Project Learning Tree PreK-8 Activity Guide* is available in the Northside Media Center professional collection.
- ✓ Make copies of the *Tree Lifecycles* student page, 1 per student or small group.
- ✓ Walk around your schoolyard to plan where you can walk with your class to see various stages of a tree's life cycle.

Vocabulary

Seed, leaf, plant

Procedure Part 1

Use *Project Learning Tree* Activity 79 - *Tree Lifecycle* (p. 341-344) for both Part 1 and Part 2. **Note:** The directions below modify the order in which the activities are conducted from the original version.

Mini-Lesson

- Discuss the idea of life cycles by comparing the life cycle of a person with that of a tree. (1. under "Doing the Activity" p. 342)

Independent Work

- Have students create a life cycle of a tree. (2. under "Doing the Activity" p. 342)

Procedure Part 2

Independent Work

- Take students on a walk outside in search of trees at the varying stages of their life cycle. (Enrichment p. 343)
- **Nature Journal Prompt:**
  - Sketch and describe each stage of the life cycle you see: Sapling, Juvenile, Young Adult, Adult, Injured or Unhealthy, Elderly, Dead. What factors are affecting each stage?

Assessment

- Grade the independent work from Part 1 and/or Part 2. Refer to "Assessment Opportunities" on p. 341 for criteria for grading.

Learning Objectives:
Diagram the life cycle of a tree to show their understanding of that life cycle and the tree's role in the ecosystem throughout its life.

Nutshell/Skill:
Students can draw and describe each stage of a tree's life cycle.

Science Essential Standards:
3.L.2.3

ELA Essential Standards:
W.3.2

Time:
Part 1: 30 minutes
Part 2: 30 minutes

Teacher Materials:
- *Project Learning Tree* Activity 79 *Tree Lifecycle* (p. 341-344)

Student Materials:
- Nature Journals
- Pencils
- *Tree Lifecycles* student page

Opportunities for Extended Learning

1. You could do the "Variation – Plant Personification" (p. 342-343) in addition to or instead of one of the other parts of this activity.
2. Have students compare the life cycle of a tree to the life cycle of another plant.

Behavior Management Tips

- Discuss appropriate ways to interact with the trees.
  - Students should be observing the trees with their eyes.
  - Suggest positive interactions like high five's and fist bumps or even hand to leaf shakes.
  - Give limits such as they may choose one stage of the life cycle to touch the tree.
  - These will reduce the leaf pulling and other damaging interactions and help the flow of the activity for timing purposes.
- For your tree walk, plan multiple stops for students to be able to draw and describe each stage in a tree's life cycle.
  - Use each stopping point as a way to refocus the group on the task.

Arc 3 – Environmental Conditions

Essential Questions

How do environmental conditions affect plant growth?

NC Science Essential Standards – Unpacked Content

3.L.2.1 Students know the names and functions of major plant parts (roots, leaves, stems, flowers). Students know that plants have special parts that perform special functions in order for the plant to survive.

3.L.2.2 Students know that how well plants grow and survive is determined by a combination of environmental conditions. For example, drought conditions will tend to diminish plant health and growth.

3.L.2.3 Students know the distinct stages of the life cycle of seed plants (seed, germination, seedling, adult).

3.L.2.4 Students know that different soils possess different textures and capacities for the retention of water and nutrients. Students know that soil consists of different components. Students know that these characteristics of soil influence the growth and survival of plants.

Lessons in this Arc

- Learning Activity 12: Plant Scavenger Hunt
- Learning Activity 13: Garden Activity – Weeding
- Learning Activity 14: Schoolyard Plants
- Learning Activity 15: Design & Build a Plant
- Learning Activity 16: From a Seed to a Plant – Part 2

Go Outdoors!

- ✓ Learning Activity 12: Plant Scavenger Hunt
- ✓ Learning Activity 13: Garden Activity – Weeding
- ✓ Learning Activity 14: Schoolyard Plants

Nature Journal Connection

- Learning Activity 12: Plant Scavenger Hunt
- Learning Activity 13: Garden Activity – Weeding
- Learning Activity 14: Schoolyard Plant

Duration

6 days of 30 minute lessons

Background Information

Soil and other environmental conditions determine how well a plant will be able to grow and develop. Plants need the right environment which provides the right amounts of what it needs. For example, a banana tree needs hot temperatures year-round to produce fruit and a cactus needs water infrequently. The **environment** consists

of all external conditions and influences acting on living things. For instance, plants need proper sunlight to be able to grow. Nutrients are materials, including nitrogen, phosphorous, and potassium, needed for plants to grow. Plants also need water and carbon dioxide to complete photosynthesis. These factors are necessary parts of the plant's environment. Changes in a plant's environment can affect its ability to grow and its growth rate. A **drought** is a prolonged period of dry weather. During a drought the plants may not receive enough water to be able to grow and develop properly. How environmental conditions affect plants is studied by botanists. A **botanist** is a scientist who studies plants.

Vocabulary

- **Botanist** is a scientist who studies plants.
- **Drought** is a long period of dry weather.
- **Environment** is all external conditions and influences that affect the development and survival of a living thing or group of living things.

Literature Connections

Books

- *Weslandia* by Paul Fleischman (E FLE)*
- *The Curious Garden* by Peter Brown (E BRO)*
- *The Giving Tree* by Shel Silverstein (E SIL)*
- *How Groundhog's Garden Grew* by Lynne Cherry

Book sets

- *Where Do Plants Grow?* By Louise and Richard Spilsbury*
- *Plant Secrets* by Anna Claybourne*

* currently available in Northside Elementary's media center

Learning Activity 12
Plant Scavenger Hunt

Lesson Prep

- ✓ Make copies of the scavenger hunt.
- ✓ Identify where you plan to take your class to be able to find most or all of the items on the list.
- ✓ Gather other supplies as needed.

Vocabulary

Leaves, stem, flower, seed, fruit, root

Procedure

Independent Work

- Students will complete a **plant scavenger hunt** outside.
- The scavenger hunt can be completed on a slow hike or in one location. Clear boundaries should be set at any stopping points that do not involve staying on a trail.
- Students should check off on their paper each item they find.
- Students could take **pictures** using iPads of each item that they find.
- Students could work in **pairs**. If working in pairs, have students discuss how they will share the work **before** going outside.
- Before going outside, talk about appropriate interactions with the plants. Students should leave plants in the same condition they find them. Students are **not** collecting plant parts for this scavenger hunt. Teach students how to *identify poison ivy*.

Assessment

- Students could share their photos in a group or with the class.
- Students should be able to identify which item on the scavenger list the photo matches.

Opportunities for Extended Learning

1. **Nature Journaling Prompt:** 
   - Draw and describe 2 things from your scavenger hunt.

Behavior Management Tips

- ♦ Ask students to remind you of the expectations for outdoor learning.

Learning Objectives:
Students will be able to accurately identify the parts of a plant on live plants.

Nutshell/Skill:
Students can use their observation skills and knowledge of plant parts to complete a scavenger hunt.

Science Essential Standards:
3.L.2.1, 3.L.2.3

Time:
30 minutes

Student Materials:
- Copies of scavenger hunt
- Writing utensil
- Rulers or ruler app
- iPads (optional)
- Clipboards (optional)

Plant Scavenger Hunt

A leaf:

____ With 5 points

____ Longer than 2.25 inches

____ Shorter than 2.25 inches

____ With smooth edges

____ With jagged edges

____ Wider than 1.5 inches

____ Thinner than 1.5 inches

____ That is green

____ That is brown

____ That is yellow

____ With insect holes

A flower:

____ That is yellow

____ With 5 petals

____ With more than 10 petals

A stem:

____ That is stiff

____ That is flexible

____ With more than 20 leaves

____ That is longer than 1 foot

____ That is shorter than 4.25 inches

____ A seed

____ A fruit

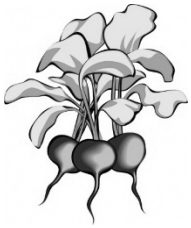
____ A tree

____ A weed

____ A flowering plant

____ Evidence of a decomposer

____ A plant that you could eat



Learning Activity 13
Garden Activity: Weeding

Lesson Prep

✓ Find a location in the school garden, or in a planting bed on school grounds, where students can pull weeds.

Vocabulary

Environment, plant, seed, leaves, stem, roots, flowers, fruit

Procedure

Mini-Lesson

- Take the class to the school garden. Alternatively, you can use any landscaped area of the school grounds.
- Ask students to tell you what a weed is.
  - A weed is a plant that is growing somewhere you don't want it to grow. It can be any type of plant.
- "What plants in our garden are weeds? What plants don't we want growing here?" Have students point to weeds near them.
- "How did these weeds get here?"
  - Seed dispersal - wind, washed by rain, animals, etc. The plants were here before the garden was planted and grew back.
- "Why are these weeds growing here?" The seeds found the right environmental conditions to grow. The plants are getting the right amount of sunlight, water, air, and nutrients.
- "Do weeds have all the parts of a plant?" Ask for volunteers to point out the different parts on a weed. You may pull a weed to be able to see all the parts.
- Explain to students that when you pull weeds from a garden, you want to pull up the whole plant, roots included. You also don't want to hurt the plants you do want growing in the garden.
  - "How can we pull up weeds without hurting other plants? What tools do we need to be able to remove the roots and all of the weed?"
- Model how to pull weeds gently.

Independent Work

- Have students spend time pulling weeds in the garden.
- Grass is usually an easily identified weed for students to pull. Ask students to describe what grass looks like and how it is different from other plants in the garden. Grass has very long, thin leaves which often appear to grow directly from the roots without a stem. The veins in grass leaves run parallel to each other.
- Another option is to pull all plants growing on paths in the garden.

Learning Objectives:
Practice identifying different parts of a plant.

Nutshell/Skill:
Students can demonstrate their ability to identify different parts of a plant.

Science Essential Standards:
3.L.2.1, 3.L.2.2, 3.L.2.3, 3.L.2.4

Math Essential Standards:
NC.3.OA.3 (extension)

Time:
30 minutes

Student Materials:
- Small trowels or other tools for digging
- Nature Journals
- Writing utensils
- Private Eyes or other magnifiers

- **Nature Journaling** prompt: 
  - Draw and label one of the weeds you pulled.

Assessment

- **Exit ticket** – Name the parts of a plant that you observed today. Give the function of each part.

Opportunities for Extended Learning

1. Have students complete the multiplication and division worksheet of garden related word problems "Numbers in the Garden". There are two versions – one with the problem set up and one without.
2. Learning opportunities in the garden abound!
   - Improve soil conditions for plants by adding compost to the garden beds. Make sure you use compost that has decomposed to look like soil.
   - Start vermicomposting. NC State Extension has resources about vermicomposting, such as *Earthworm Composting* and *Vermicomposting*.
   - Have the garden *soil tested by NC Cooperative Extension*. Discuss the results and what can be done to improve the soil for plant growth.
   - Plant vegetables or flowers. Observe over time. Compare to the plants growing in the classroom.
   - Harvest what is ripe. Discuss what part of the plant it is and what part of the plant's life cycle.
   - Walk through the garden identifying parts of plants and their needs. Do any of the plants look like their needs aren't being met? Do they need watering?

Behavior Management Tips

- Model and describe proper tool use for observing and removing weeds. In particular, discuss applicable safety issues with digging tools.

Name _____ Date _____

Numbers in the Garden

1. A garden bed has 9 earthworms living in it. An earthworm can eat 5 leaves each week. How many leaves can the earthworms eat all together?

2. The garden has 35 flowers growing in it. The garden was planted with 5 flowers in each garden bed. How many garden beds are in the garden?

3. The class has been divided into 6 groups. Each group is given 4 seeds to plant in the garden. How many seeds in total will the class plant?

4. One garden bed has 18 kale plants growing in it. The kale was eaten by 6 rabbits. If each rabbit ate the same amount of kale, how much kale did each rabbit eat?

5. Each class gets to spend 10 minutes working in the garden. Each day 6 classes work in the garden. How much total time is spent working in the garden each day?

Name _____ Date _____

Numbers in the Garden

1. A garden bed has 9 earthworms living in it. An earthworm can eat 5 leaves each week. How many leaves can the earthworms eat all together?

   9 x 5 = _____

2. The garden has 35 flowers growing in it. The garden was planted with 5 flowers in each garden bed. How many garden beds are in the garden?

   35/5 = _____

3. The class has been divided into 6 groups. Each group is given 4 seeds to plant in the garden. How many seeds in total will the class plant?

   6 x 4 = _____

4. One garden bed has 18 kale plants growing in it. The kale was eaten by 6 rabbits. If each rabbit ate the same amount of kale, how much kale did each rabbit eat?

   18/6 = _____

5. Each class gets to spend 10 minutes working in the garden. Each day 6 classes work in the garden. How much total time is spent working in the garden each day?

   10 x 6 = _____

ANSWER KEY

Numbers in the Garden

1. A garden bed has 9 earthworms living in it. An earthworm can eat 5 leaves each week. How many leaves can the earthworms eat all together?

   9 x 5 = **45**

2. The garden has 35 flowers growing in it. The garden was planted with 5 flowers in each garden bed. How many garden beds are in the garden?

   35/5 = **7**

3. The class has been divided into 6 groups. Each group is given 4 seeds to plant in the garden. How many seeds in total will the class plant?

   6 x 4 = **24**

4. One garden bed has 18 kale plants growing in it. The kale was eaten by 6 rabbits. If each rabbit ate the same amount of kale, how much kale did each rabbit eat?

   18/6 = **3**

5. Each class gets to spend 10 minutes working in the garden. Each day 6 classes work in the garden. How much total time is spent working in the garden each day?

   10 x 6 = **60**

Learning Activity 14
Schoolyard Plants

Lesson Prep

- ✓ Register for a *Project Budburst Educator Account*. Click on "My Account" at the top right of the screen to create a Log In.
- ✓ Identify areas in the schoolyard where students can make observations of chosen plants.
- ✓ Preview the *slides* about Project Budburst
- ✓ Make copies of the Budburst datasheets. If completing where there is Internet access, students could complete the online version of the datasheets.
- ✓ Make copies of the Nature Journaling prompts, 1 per student.

Vocabulary

Botanist

Procedure

Independent Group Work

- Students will observe plants growing in different parts of the campus and hypothesize why they are growing in that location.
- Before going outside have students paste the Nature Journaling prompts into their nature journals.
- Tell students they are going to be botanists today. Ask a student what that means. Botanists are scientists who study plants, as they will be doing.
- Students will go outside to make observations of the plants in their schoolyard and nearby areas by participating in a Citizen Science project called Budburst, *https://budburst.org/*.
- Groups of 3-4 will collect and submit data about the plants growing near the school.
    - Scientists will use the data collected by students to improve the understanding of how different species are affected by human impacts on the environment.
- Choose to collect data on one occasion, or begin collecting life cycle data of a plant species throughout the unit or school year, such as the American beeches growing along the greenway.
- Use *this PowerPoint* to help teach about Budburst. Additional information about using Budburst in your classroom can be found *here*, including forms for collecting data.
- After students have finished collecting data, they can respond to the **Nature Journaling** prompt:
    - Sketch and describe your plant. Include information about the current stage of the plant's life cycle and label the plant's parts.
    - What evidence do you see of the environmental conditions that support the growth of your plant in this location?

Learning Objectives:
Observe the different types of plants and the environments in which they grow around school.

Nutshell/Skill:
Students can observe plants, their life cycle stage, and their environmental conditions.

Science Essential Standards:
3.L.2.1, 3.L.2.2, 3.L.2.3, 3.L.2.4

ELA Essential Standards:
W.3.2

Time:
30 minutes

Teacher Materials:
- Project BudBurst Educator Account
- *PowerPoint* about Budburst

Student Materials:
- Nature Journals
- Budburst data sheets or iPads/Chromebooks
- Writing utensils

Opportunities for Extended Learning

1. Have students research the plant for which they collected data. Have students include in their research and a subsequent writing assignment the environmental conditions the plant prefers and information about its lifecycle. Additionally, have them research if the plant is native to the area or considered an invasive species.
2. Opinion Writing Prompt: Your school grounds have native plants, invasive plants, and exotic plants. What are the differences between the three categories? What would you change? How would you get rid of the plants you do not want?
3. Additional resources and lessons on invasive species from the *NC Invasive Plant Council*.
4. Additional resources and lessons on native species from the *North Carolina Native Plant Society*. They also have information about *invasive species,* including a video to show students.

Behavior Management Tips

- Ask students to remind you of the expectations for outdoor learning.
- Before going outside, remind students about how to behave respectfully toward plants and nature. Ask students for how they can observe plants and gather data without harming the plants.
- Define the boundary for where the students can sit and work on their nature journaling prompt.

Budburst Nature Journaling prompt:

- Sketch and describe your plant. Include information about the current stage of the plant's life cycle and label the plant's parts.
- What evidence do you see of the environmental conditions that support the growth of your plant in this location?

Budburst Nature Journaling prompt:

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- What evidence do you see of the environmental conditions that support the growth of your plant in this location?

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Budburst Nature Journaling prompt:

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Budburst Nature Journaling prompt:

- Sketch and describe your plant. Include information about the current stage of the plant's life cycle and label the plant's parts.
- What evidence do you see of the environmental conditions that support the growth of your plant in this location?

Budburst Nature Journaling prompt:

- Sketch and describe your plant. Include information about the current stage of the plant's life cycle and label the plant's parts.
- What evidence do you see of the environmental conditions that support the growth of your plant in this location?

Learning Activity 15
Design & Build a Plant

Lesson Prep

- ✓ Gather materials students can use to build a model of a plant. A variety of materials is great, but students can use just paper and tape.
- ✓ Copies of the *Design and Build a Plant Instructions*, one per group.
- ✓ Copies of the *Environmental Conditions Cards*, if using.
- ✓ Copies of the presentation rubric, one per group.
- ✓ Preview the slideshow.

Vocabulary

Botanist, drought, environment, nutrients, leaf, stem, flower, fruit, roots, soil

Procedure

Mini-Lesson

- Use *this slideshow presentation* to review plants and give instructions. Go over the presentation rubric with the class before they begin designing and building their plants.

Independent Group Work

- Students will work in small groups (2-3 students) to build a plant with all its parts out of various materials such as construction paper, paper towel tubes, and plastic spoons.
- You can choose to assign environmental conditions to different groups using the cards on the following pages. You could also assign the same environmental condition to the whole class.
- This lesson works best at the end of the plants unit to allow students to incorporate their knowledge of soils, root structure and environmental conditions.
- Students will need to prepare to present their plants to the class.
- Students will present their plants to the class explaining the various parts and how it is adapted to its environmental conditions.

Assessment

- Use the rubric to assess the presentations.

Learning Objectives:
Apply their knowledge of plants, soil, and environmental conditions by building a plant.

Nutshell/Skill:

- Students can design and build a model of a plant to suit particular environmental conditions.
- Students can present their models and related information.

Science Essential Standards:
3.L.2.1, 3.L.2.2, 3.L.2.3, 3.L.2.4

ELA Essential Standards:
SL.3.1, SL.3.3, SL.3.4

Time:
1-3 sessions of 30 minutes each

Teacher Materials:

- *Build A Plant* slideshow
- Rubric for presentations

Student Materials:

- Plant building materials such as:
  - paper towels tubes
  - cardboard
  - construction paper
  - tissue paper
  - toothpicks
  - chenille stems
  - craft sticks
  - straws
  - tape
  - markers
- Design and Build a Plant Instructions
- Environmental Conditions Cards (optional)

Behavior & Materials Management Tips

- ♦ Be prepared with clean up instructions for the plant model materials.
- ♦ Consider using a photograph to show students what cleaned up looks like.

Design and Build a Plant Instructions

- As a team of **botanists**, your group has discovered a new species of plant.
- Build a **model** of this new species of plant.
- Include **all** the parts of a plant.
- What are the **habitat needs** of your plant?
- Describe your plant's **environment**.
- Where does your plant grow?
- What is the **name** of your plant?
- Prepare to **present** your plant, including the answers to **all** these questions, to your class.

Design and Build a Plant Instructions

- As a team of **botanists**, your group has discovered a new species of plant.
- Build a **model** of this new species of plant.
- Include **all** the parts of a plant.
- What are the **habitat needs** of your plant?
- Describe your plant's **environment**.
- Where does your plant grow?
- What is the **name** of your plant?
- Prepare to **present** your plant, including the answers to **all** these questions, to your class.

Environmental Conditions Cards for Build a Plant

You can give each group an environmental condition card as a starting point for the conditions in which their plant grows.

Grows in a desert

Good at surviving droughts

Grows in soil that is mostly clay

Grows in a forest

Grows near the ocean

Grows in the shade

Grows in very sunny places

Grows in a windy habitat

Grows in sandy soil

Grows in a cold climate

Grows in the mountains

Grows near water

Grows in a rainforest

Grows in humus

Names _____ Score _____

Rubric for Build a Plant Presentations

	4—Excellent	3—Good	2—Fair	1—Needs Improvement
Model	All Parts of a Plant - Roots, leaves, stem, flower or explanation as why no flower	All Parts of a Plant - Roots, leaves, stem, flower or explanation as why no flower	Missing **1** plant part	Missing **2 or more** plant parts
Content of presentation	**Detailed** description of the plant's parts, habitat needs, environment, location, and name	**Brief** description of the plant's parts, habitat needs, environment, location, and name	Missing **1 or 2** pieces of description of the plant's parts, habitat needs, environment, location, and name	Missing **3 or more** pieces of description of the plant's parts, habitat needs, environment, location, and name
Delivery	*Makes consistent eye contact which holds audience's attention *Speaks loudly and clearly with fluency *Answers questions thoroughly	*Makes eye contact with audience *Speaks loudly and clearly *Answers questions clearly and completely	*Makes some eye contact with audience *Speaks loudly and clearly most of time *Answers questions but not clearly and completely	*Doesn't make eye contact with audience *Speaks too quietly, mumbles, or too fast *Can't answer questions
Collaboration	**All** of group **equally** shares presenting	**All** of group presents	**Most** of group presents	Only **1** person presents

Comments

_____

_____

Learning Activity 16
From a Seed to Plant: Part 2

Lesson Prep

✓ Make copies of *From a Seed to a Plant: Part 2* data sheet, 1 per student.

Vocabulary

Environment, leaf, stem, roots, soil

Procedure

Guided Practice

- Model how to use the data to create a bar graph.
- The students' data sheet has a blank bar graph on the back. Additionally, there is a blank bar graph at the end of this lesson to use as an example.
- Prompt students to tell you how to add numbers to the y-axis on their graph.
- Model adding a bar for group 1.
- Give students the option to use different colors for the bars to make it easier to read.

Independent Group Work

- Students will use the data sheet to collect final data on the plants that they have grown in the classroom.
- Once final plant data is collected, have students share their final measurements with the class. You can project the class data sheet for each group to fill out.
- Students will analyze their data and compare it with the class data.
- Students will draw conclusions about their findings about the best conditions found to grow the biggest, healthiest plants.
- If radish or other vegetable is grown and ready, allow students to harvest and taste what they have grown.

Assessment

- Grade *From a Seed to a Plant: Part 1* and *From a Seed to a Plant: Part 2* data sheets.

Behavior Management Tips

♦ Have 1 group member from each group take their plants to a spot where the group can work together to complete the data sheet.

Learning Objectives:
Students will draw conclusions about their experiment planting seeds.

Nutshell/Skill:
Students can make connections between the environment in which their plant grew and how well it grew.

Science Essential Standards:
3.L.2.1

Math Essential Standards:
NC.3.MD.2, NC.3.MD.3

Time:
30 minutes

Teacher Materials:
- Control plants

Students Materials:
- Plants that students have grown
- Rulers
- *From a Seed to a Plant: Part 2* data sheet
- Completed *From a Seed to a Plant: Part 1* data sheets

Name: _____ Group members: _____

From a Seed to a Plant: Part 2

1. Collect your final plant data.

Day	How tall?	How many leaves?	Observations
Day	Plant 1 = _____ Plant 2 = _____	Plant 1 = _____ Plant 2 = _____	

2. Draw your plants. Label the parts: roots, stem, leaves.

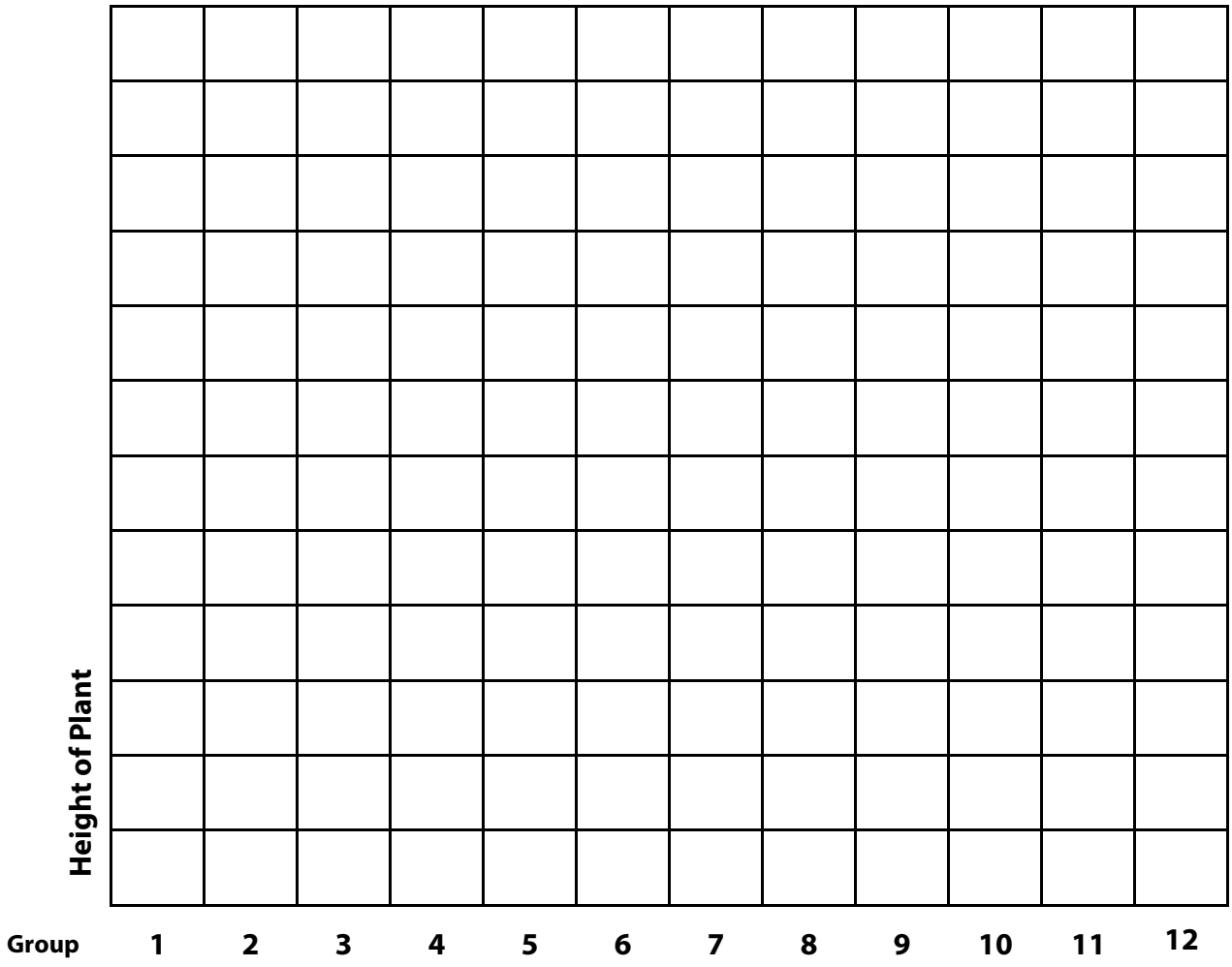
Plant 1	*Plant 2*

3. Which plant grew better? Why?

_____

_____

4. Create a bar graph of each group's tallest plants.



5. Which environmental conditions grew the biggest plant?

_____

6. What could you have done different in your experiment to grow a bigger plant?

_____

_____

_____

7. Describe another experiment you could do to learn about the best environmental conditions for a plant to grow and survive.

_____

_____

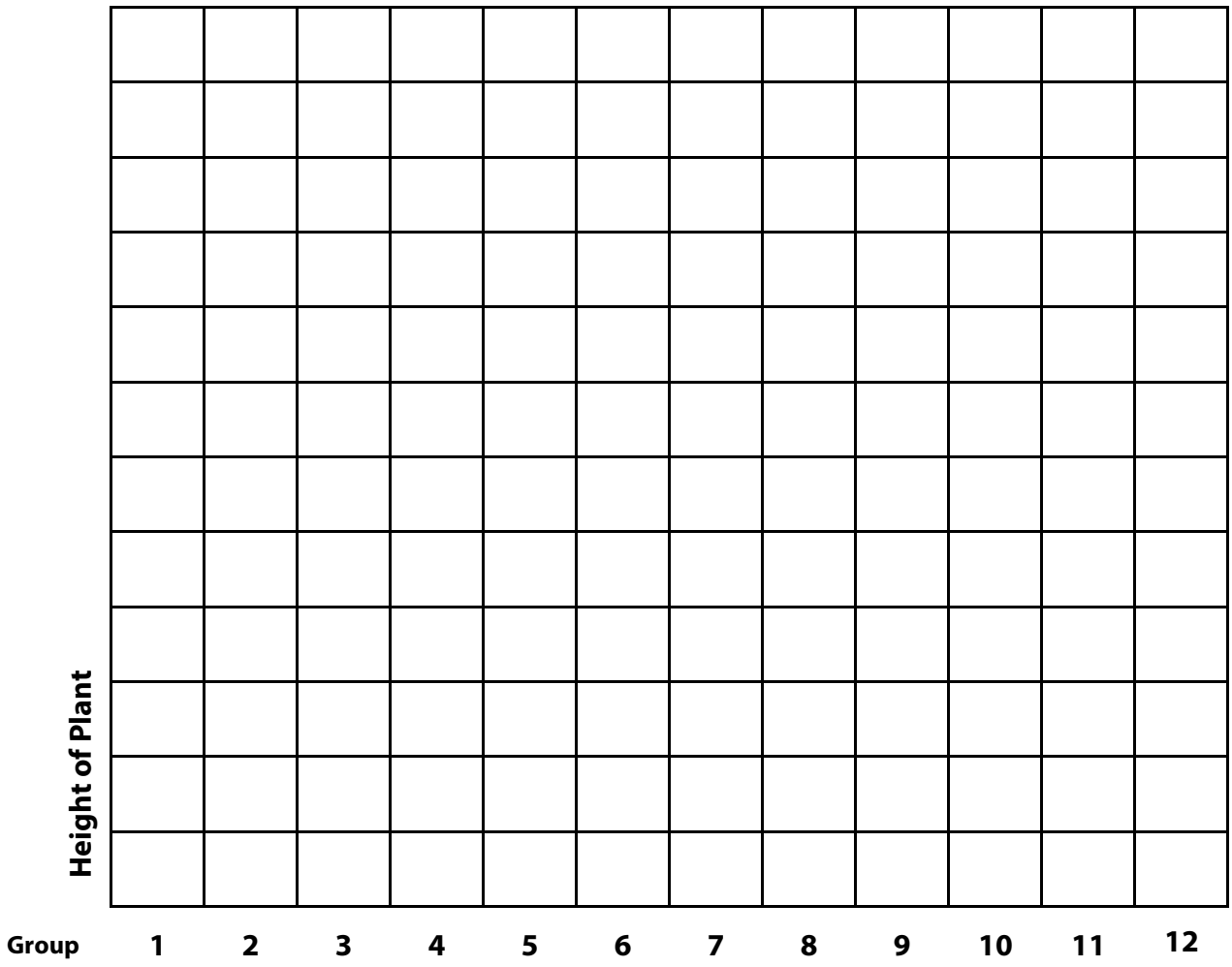
_____

Class Data - From a Seed to a Plant: Part 2

Enter your groups final height data below. Under "What testing?", write what was different between the environmental conditions for plant 1 and 2.

Group	Names	How tall?	What testing?
1		Plant 1 = _____ Plant 2 = _____	
2		Plant 1 = _____ Plant 2 = _____	
3		Plant 1 = _____ Plant 2 = _____	
4		Plant 1 = _____ Plant 2 = _____	
5		Plant 1 = _____ Plant 2 = _____	
6		Plant 1 = _____ Plant 2 = _____	
7		Plant 1 = _____ Plant 2 = _____	
8		Plant 1 = _____ Plant 2 = _____	
9		Plant 1 = _____ Plant 2 = _____	
10		Plant 1 = _____ Plant 2 = _____	
11		Plant 1 = _____ Plant 2 = _____	
12		Plant 1 = _____ Plant 2 = _____	

Bar graph of each group's tallest plants.



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Engaging Activity: What Do You See?
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Learning Activity 1: What is in Soil?
Scholastic Inc. (n.d.). Soil: StudyJams! Science. Retrieved from http://studyjams.scholastic.com/studyjams/jams/science/rocks-minerals-landforms/soil.htm
Soil Science Society of America. (n.d.). K-12 Soil Science Teacher Resources. Retrieved from https://www.soils4teachers.org/soil-horizons
Utah Education Network. (2018, February 5). Soil Ingredients. Retrieved from https://www.uen.org/lessonplan/view/2494

Learning Activity 2: How Does Water Move Through Soil?
Driscoll, L. (2018). Soil Solutions. Retrieved from https://growforit.ces.ncsu.edu/curriculum/soil-solutions/
NC State University. (n.d.). Orange County Center NC Collaborative Extension. Retrieved from https://orange.ces.ncsu.edu/
Utah Education Network. (2018, February 05). Sand, Clay and Humus. Retrieved from https://www.uen.org/lessonplan/view/33048

Learning Activity 3: Compost
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NC State University. (n.d.). Orange County Center NC Collaborative Extension. Retrieved from https://orange.ces.ncsu.edu/
SciShow Kids. (2016, April 20). Make the Most of Compost! Retrieved from https://www.youtube.com/watch?v=Q5s4n9r-JGU

Learning Activity 4: From a Seed to a Plant: Part 1
Capstone. (n.d.). Pebble Go. Retrieved from https://www.pebblego.com/
Old Farmer's Almanac. (n.d.). Radishes. Retrieved from https://www.almanac.com/plant/radishes

Learning Activity 5: Plants and Their Parts
Capstone. (n.d.). Pebble Go. Retrieved from https://www.pebblego.com/

Learning Activity 6: Down Under
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Bodach, V. (2018). Roots. Oxford: Raintree.

Learning Activity 7: Looking at Leaves

Arbor Day Foundation. (n.d.). What Tree Is That? Retrieved from https://www.arborday.org/trees/whattree/

Mystery Doug. (2017, October 09). Why do leaves change color in the fall? Retrieved from https://www.youtube.com/watch?v=vg-JhWcTz-Y

ParticleMen. (2010, March 25). They Might Be Giants - Photosynthesis (official video). Retrieved from https://www.youtube.com/watch?v=LgYPeeABoUsideo

Learning Activity 8: Flower Power

Mystery Doug. (2019, May 13). How do flowers bloom in the spring? Retrieved from https://www.youtube.com/watch?v=M9-GkbwCTkw

SciShow Kids. (2017, February 16). Look Inside a Flower! | Science Project for Kids. Retrieved from https://www.youtube.com/watch?v=R9sn7HZM7uY

Tulip Diagram Coloring Page: Crafts for kids: Teaching plants, Kindergarten science, Preschool worksheets. (n.d.). Retrieved from https://www.pinterest.com/pin/235524255489175532/

Learning Activity 9: Sizing Up Seeds

Aston, D. H., & Long, S. (2014). A Seed is Sleepy. Mankato, MN: Amicus.

Macken, J. E., & Paparone, P. (2009). Flip, float, Fly: Seeds on the Move. New York: Scholastic.

Learning Activity 10: Plant Life Cycle

BrainPOP. (n.d.). Seed Plants. Retrieved from https://www.brainpop.com/science/diversityoflife/seedplants/

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SciShow Kids. (2015, June 22). How Does A Seed Become A Plant? Retrieved from https://www.youtube.com/watch?v=tkFPyue5X3Q

Learning Activity 11: Tree Life Cycle

Project Learning Tree. (2015). Activity 79: Tree Lifecycle. In Project Learning Tree PreK-8 Environmental Education Activity Guide (pp. 341-344). Washington, D.C: American Forest Foundation.

Learning Activity 12: Plant Scavenger Hunt

Jonathan Sachs Graphics. (2016, June 17). Identify the Plant. Retrieved from https://www.poison-ivy.org/identify-poison-ivy-poison-oak

Learning Activity 13: Garden Activity: Weeding

North Carolina State University. (2001). Earthworm Composting: NC State Extension Publications. Retrieved from https://content.ces.ncsu.edu/earthworm-composting

North Carolina State University. (2018). Soil Testing for Lawns and Gardens. Retrieved from https://chatham.ces.ncsu.edu/soil-testing-for-lawns-and-gardens/

North Carolina State University. (2008). Vermicomposting: A 5th Grade School Enrichment Curriculum. Retrieved from https://content.ces.ncsu.edu/vermicomposting-a-5th-grade-school-enrichment-curriculum