May 2019 Book of the Month
*A Seed Is Sleepy*
By: Dianna Hutts Aston & Sylvia Long

This book opens with a beautiful spread showing sunflower seeds nestled within the center of a ripe sunflower head. It provides readers with an up close look of some common (and not so common) plants and seeds. The illustrations and poetic language show seeds being secretive (lying dormant for a season or for years), fruitful (encased in blueberries and papayas), naked (in pine cones), in many sizes (from dust to 60 pound seeds), adventurous (scattered by wind or floating in water), inventive (sticking to sneakers), generous (providing food for the new sprout), ancient, thirsty, hungry, clever (photosynthesis), and finally awake!
A Seed Is Sleepy shows the many different qualities of seeds, as well as the life cycles of the plants they start. It is a great book for opening a unit on plants or gardening.[1]
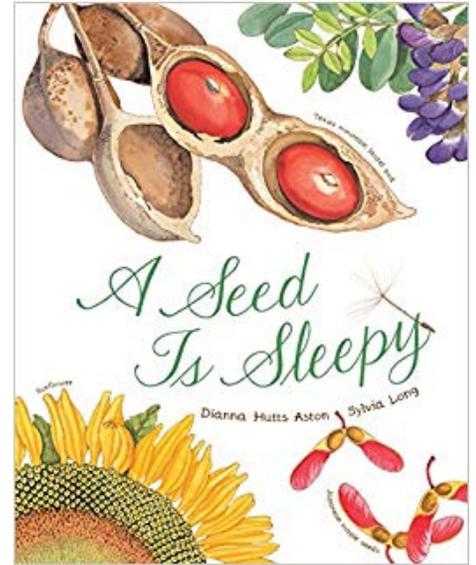
Fun Facts
- Seeds require sunlight, air, soil, and water to survive and grow.
- Seed quality plays an important role in the production of agronomic and horticultural crops. Characteristics such as trueness to variety, germination percentage, purity, vigor, and appearance are important to farmers planting crops.[2]
- In nature, seeds are dispersed by a number of ways, such as by wind or animals, but one of the more interesting ways is how plants such as mistletoe have seeds that are "spring loaded" and shoot from the parent plant into the air.[2]
- Seed certification is a process that verifies that genetically pure seed is available to farmers for planting. The North Carolina Crop Improvement Association (NCCIA) is responsible for seed certification in North Carolina.[2]
- North Carolina's top row crops planted by seed are cotton, soybeans, and corn.[3]

Vocabulary
Seed: what a flowering plant produces in order to reproduce another plant.
Gymnosperms: types of plants that don't produce fruit, and have "naked" seeds—seeds that hide themselves in cones or other seed protectors. A pine tree is an example of a gymnosperm.
Embryo: the beginning stage of a plant; contains the earliest forms of the plant's stems, roots, and leaves.
Cotyledon: the first leaf to emerge from the seed embryo.
Monocot: seeds containing only one seed leaf (cotyledon), such as corn.
Dicot: seeds containing two seed leaves, such as beans.
Radicle: the part of the seed embryo that develops into the primary root.

Plumule: portion of the seed embryo that develops into the primary shoot, or stem.
Seed coat: protective outer layer of a seed.
**Germinate:** to come out of dormancy and begin to grow and put out shoots.
Photosynthesis: process by which plants make energy using sunlight, water, minerals, and carbon dioxide.

Growing a Garden[4]
You will need the following materials for this activity:
- 9-10 oz. clear plastic cups with 2-3 drainage holes in the bottom.
- Seeds
- Potting soil
- Water spray bottle
- Trays to hold cups or pots

1. Ask the students where the food they eat comes from. After getting responses from several volunteers, follow this up by asking if anyone grows some of their own food.
2. Inform the students that they will start growing some plants to investigate how they grow and what makes them grow best.
3. Provide each students with a copy of the *Master 1.1 My Gardening Record worksheet* (attached to this activity sheet and in **Links** section). Give each student a few seeds to examine. Ask students to draw a picture of their seed in the appropriate space and to write a few words to describe the appearance of the seeds.
4. Provide each student with cups (with drainage holes) and potting soil. Model for the students how to plant their seeds. Point out that the cups have holes in the bottom so extra water can drain out. Fill the cup up half full with potting soil, and moisten the soil with the water spray bottle. Place five seeds on top of the soil. Draw the pattern for arranging the seeds on the board or chart paper. Put a thin layer, about ¼ - ½" of soil on top of the seeds. Use the spray bottle to moisten the top layer of soil.
5. After the students plant their seeds, have them complete part 2 of their worksheets.
6. Over the next several days, allow student time to water, observe their seedlings, and record their data on their worksheets.
7. In the space provided on their worksheets, ask the students to draw pictures of their seed when it is first sprouting and then the seedling when it is about one week old.
8. If the students planted different seeds, have them compare the different kinds of seedlings. Ask them if they see differences in leaf shape, leaf size, color of stems or leaves, and so forth.
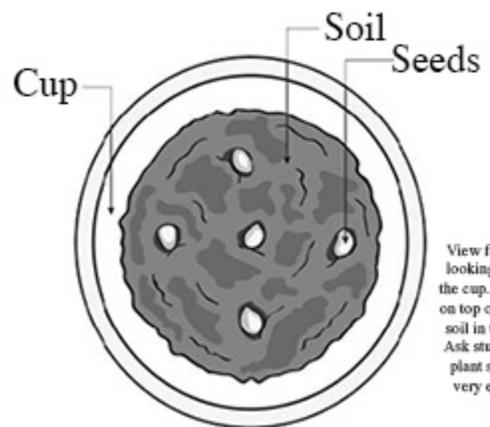
View from the top looking down into the cup. Place seeds on top of the potting soil in this pattern. Ask students not to plant seeds at the very edge of the cup.

9. If each student planted the same type of seed in one cup, you can pool the data for each one kind of seed from the entire class for analysis. Begin by collecting the data from each student on *Master 1.2 Time For Seed Sprouting worksheet* (attached to this activity sheet and in **Links** section). Then, use the data to construct a bar graph using a template similar to the one below (or let students construct the graph using the data).
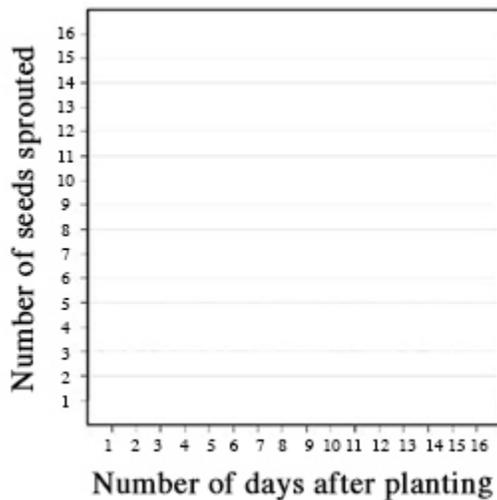
You can use an X to represent each seed that has sprouted. Alternatively, you can use a sticky note to represent each sprouted seed. This will form a bar graph of the class' pooled data.

Discuss the data with the class to make conclusions about the time needed for seeds to sprout. The data should reveal that the seeds germinated over a range of days. Even though they were all the same type of seed, there were differences in the time it took for the seeds to sprout. It is also likely that some seeds didn't sprout at all; perhaps those seeds got damaged in some way or they weren't healthy. Just as in humans and all other species, there are differences between individuals. Guide the discussion using questions such as:

- When did the first seeds sprout?:
- On what day did the greatest number of seeds sprout?
- Did all the seeds sprout on the same day?
- Did all the seeds sprout?
- Why do you think some seeds didn't sprout?
- Why do you think seeds sprouted at different times?

10. Ask students to draw some conclusions based on what they have learned from the seed growing activity. Some possible conclusions are:
    a. Some kinds of seeds sprout more quickly than others.
    b. Some seeds may not sprout at all.
    c. Different seedlings look different than others in their size, shape of leaves, color and so forth.
    d. If you have more than one seed of the same kind, you can see differences between individuals (e.g., time to germinate or size may be different among individuals).

Seed Dissection[5]
Materials:
- *Seed Dissection worksheet* (attached to activity sheet, and in **Links** section)
- Seeds for dissecting (1 per student of each variety)

- Kidney or lima beans
- Corn (Make sure the corn is untreated. You may need to get this from a health food store, a feed and seed store, or a store that stocks whole grains.)
- Pine Nuts (Optional. These are typically available in the produce section of a grocery store through the fall and winter.)
- Dish of water for soaking

1. Pass out one copy of the *Seed Dissection worksheet* to each student.
2. Using the "A Seed is Generous" page found in *A Seed Is Sleepy*, show students the parts of a seed. Share the corresponding vocabulary with the students. Use the Seeds PowerPoint (in **Links** section) for supplemental information. Have them label the diagram on their worksheet and write the functions of the seed coat, food supply, and embryo.
3. Soak the seeds (except the pine nut) in water for 24 hours at room temperature. Drain the seeds and pass out a bean, corn, and pine seed to each student. Follow the instructions below to dissect each seed. Have students place each dissected seed part in the labeled box at the bottom of the activity sheet.
   a. **Bean Seed**: Carefully have students remove the bean seed coat, which, before the soaking, protected the seed food source (cotyledons) and the embryo, which will become the new plant. Next, have the students gently split the bean seed—the two halves are the two cotyledons. This is where the bean seed stores the food that is used for growth until it gets its first true leaves and begins to make its own food. The students should be able to see a little lump near the edge of one cotyledon. Don't touch it yet! Carefully study the lump (a hand lens may be useful). This is the embryo—the new plant! If students look closely, they should see the delicate, translucent leaves. Finally, instruct them to separate the embryo from the cotyledon, place it on a flat surface, and look to see not only the leaves, but also the embryonic roots.
   b. **Corn Seed**: For contrast, ask the students to try to open the corn seed. You'll probably see a lot of students squish their seeds, but if they carefully remove the seed coat, and then press their fingernail into the endosperm, the cotyledon and the new embryo can be removed.
   c. **Pine Nut**: Finally, perhaps the most interesting seed to dissect is a pine nut. Ask students to gently remove the seed coat. They may have to crack this with their teeth. Next, tell them to push their fingernail through the food source and gently open it to see the embryo—a baby tree.
4. Students should now have three seed coats, three food sources, and three seed embryos in the corresponding boxes of their activity sheets. Use glue or tape to attach them.
5. Summarize what the students have learned. We eat seeds: peas, beans, peanuts, sunflower seeds, walnuts, cashews, wheat used in bread, poppy seeds, sesame seeds, and not to mention, oil that comes from seeds. Seeds truly are a miracle with potential for life and the ability to sustain lives. Review by asking these questions:
   a. What are seeds used for?
   b. Do we eat any seeds or are they used just to grow new plants?

c. Which part of the seed is the outer covering that protects the inside?
d. Which part of the seed is the largest and what is its purpose?
e. Which part of the seed will grow into the new plant?

Seed Mapping

Have students create a list of plants and seeds mentioned in *A Seed is Sleepy*. They will research where the plant originated. Then, they will research if the plant can grow in North Carolina using the USDA Zone Hardiness map, and plant zones for each plant. The Zone Hardiness map uses temperature ranges for specific regions relevant to plant growth and survival. Finally, have students create two maps—a world map to show the origins of the plants mentioned in *A Seed is Sleepy*, and a North Carolina map to show which plants are hardy to North Carolina.

Why do plants only grow in certain places? Explain to students that plants have specific needs when it comes to water, sunlight, soil, and temperature. A good analogy is a winter coat. Humans are able to put on a coat when it is cold outside, but plants cannot do that. So, plants grow where they are most comfortable and able to thrive without getting hurt by hot or cold temperatures, too little or too much sunlight, or too little or too much moisture.

Links
- Plants All Around You (video)
  https://www.youtube.com/watch?v=I_agr-F38tQ
- Master 1.1 My Gardening Record worksheet (from **Growing a Garden** activity)
  https://naitc-api.usu.edu/media/uploads/2015/04/14/Master_1-1_My_Gardening_Record.pdf
- Master 1.2 Time For Seed Sprouting worksheet (from **Growing a Garden** activity)
  https://naitc-api.usu.edu/media/uploads/2015/04/14/Master_1-2_Time_For_Seed_Sprouting.pdf
- Seed Dissection worksheet (from **Seed Dissection** activity)
  https://naitc-api.usu.edu/media/uploads/2015/07/29/Seed_Dissection_.pdf
- Seeds PowerPoint (helpful for Seed Dissection activity)
  https://naitc-api.usu.edu/media/uploads/2018/05/21/Seeds_PowerPoint.pptx
- North Carolina USDA Zone Hardiness Map
  https://www.plantmaps.com/interactive-north-carolina-usda-plant-zone-hardiness-map.php

Sources
1. http://www.carolhurst.com/titles/seedissleepy.html
2. https://content.ces.ncsu.edu/seed-and-seed-quality
3. https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=NORTH%20CAROLINA
4. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=184&grade=0,3&author_state=0&search_term_lp=seeds
5. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=213&grade=0,3&author_state=0&search_term_lp=seeds

K-5 Subject Areas
Speaking and Listening, Writing, Math, and Science
Common Core/Essential Standards
Speaking and Listening
- **SL.K.1** Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups.

- **SL.1.1** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
- **SL.2.1** Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
- **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.4.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
- **SL.5.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly.

Writing
- **W.K.5** Participate in shared investigation of grade appropriate topics and writing projects.
- **W.1.5** Participate in shared research and writing projects.
- **W.2.5** Participate in shared research and writing projects.
- **W.3.5** Conduct short research projects that build knowledge about a topic.
- **W.4.5** Conduct short research projects that build knowledge through investigation of different aspects of a topic.
- **W.5.5** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.

Math
- **NC.1.MD.4** Organize, represent, and interpret data with up to three categories**.**
  - Ask and answer questions about the total number of data points.
  - Ask and answer questions about how many in each category.
- **NC.2.MD.10** Organize, represent, and interpret data with up to four categories.
  - Draw a picture graph and a bar graph with a single-unit scale to represent a data set.
  - Ask and answer questions about how many more or less are in one category than in another**.**
- **NC.3.MD.3** Represent and interpret scaled picture and bar graphs**:**
  - Collect data by asking a question that yields data in up to four categories**.**
  - Make a representation of data and interpret data in a frequency table, scaled picture graph, and/or **scaled** bar graph with axes provided.
  - Solve one and two-step "how many more" and "how many less" problems using information from these graphs.
- **NC.5.MD.2** Represent and interpret data.
  - Collect data by asking a question that yields data that changes over time.
  - Make and interpret a representation of data using a line graph.
  - Determine whether a survey question will yield categorical or numerical data, or data that changes over time.

Science
- **K.E.1.1** Infer that change is something that happens to many things in the environment based on observations made using one or more of their senses.
- **1.L.1.1** Recognize that plants and animals need air, water, light (plants only), space, food and shelter and that these may be found in their environment.
- **1.L.1.2** Give examples of how the needs of different plants and animals can be met by their environments in North Carolina or different places throughout the world.
- **1.L.1.3** Summarize ways that humans protect their environment and/or improve conditions for the growth of the plants and animals that live there (e.g., reuse or recycle products to avoid littering).
- **1.L.2.1** Summarize the basic needs of a variety of different plants (including air, water, nutrients, and light) for energy and growth.
- **3.L.2.2** Explain how environmental conditions determine how well plants survive and grow.
- **4.L.2.1** Classify substances as food or non-food items based on their ability to provide energy and materials for survival, growth and repair of the body.

{Name _____

MY GARDENING RECORD

Part 1: The Seeds

Write the name of the seed: _____

Draw a picture of your seed.

Write two or three words to describe what your seed looks like.

_____

_____

Name

Part 2: Planting Seeds

I planted my seed on this date: _____.

How many seeds did you plant in your cup? _____

Draw a picture to show how you planted your seeds. Label each part on your picture.

Part 3: Watching Seeds Sprout

Look at your pots each day. For each day that you observe your pots, write or draw the following information.

Date _____
Number of days after planting: _____   Number of sprouts_____

Date _____
Number of days after planting: _____   Number of sprouts_____

Date _____
Number of days after planting: _____   Number of sprouts_____

Date _____
Number of days after planting: _____   Number of sprouts_____

Date _____
Number of days after planting: _____   Number of sprouts_____

Date _____
Number of days after planting: _____   Number of sprouts_____

Date _____
Number of days after planting: _____   Number of sprouts_____

Date _____
Number of days after planting: _____   Number of sprouts_____

Date _____
Number of days after planting: _____   Number of sprouts_____

Name _____

When you first see your young plants, draw a picture of what you see.

About one week after you first see your young plants, draw a picture of what you see.

Date _____

Name _____

TIME FOR SEED SPROUTING

Total Number of Seeds Planted by the Class: _____

NUMBER OF DAYS AFTER PLANTING	NUMBER OF SEEDS SPROUTED
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
Never Sprouted	

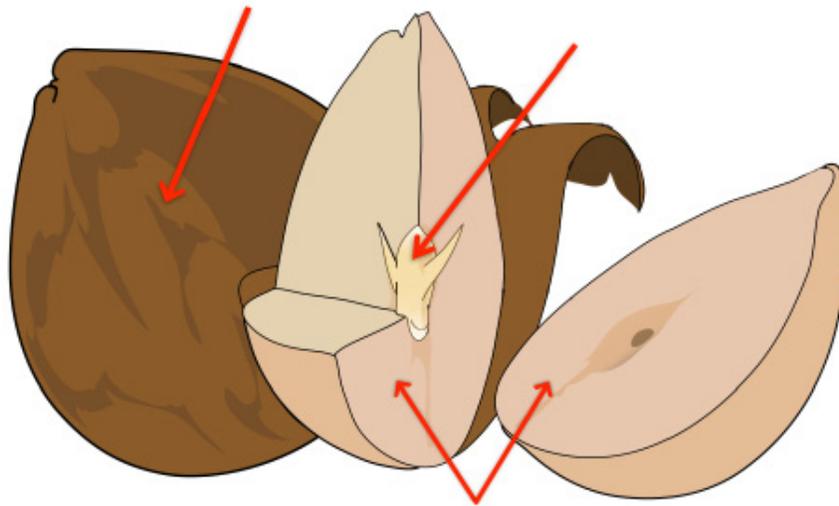Name: _____

Seed Dissection

Seed Coat:

Food Supply:

Embryo:

Place seed parts here:

Seed Coat	Food Supply	Embryo