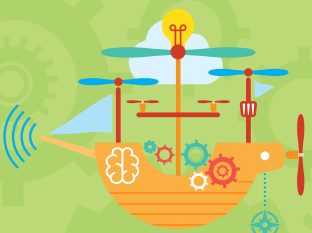




## Plants & Seeds

Grades 4-6

# CURRICULUM SAMPLE

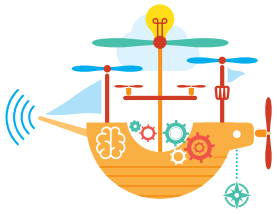


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# Plants and Seeds Second Edition

GRADES: 4-6

<b>STUDENTS</b> Up to 30	<b>TIME</b> 12, one-hour lessons
<b>SUBJECTS</b> <ul style="list-style-type: none"> <li>• Life Science</li> <li>• Art/STEAM</li> <li>• English Language Arts Connections</li> </ul>	<b>SETTINGS</b> <ul style="list-style-type: none"> <li>• Summer camps</li> <li>• Classrooms</li> <li>• Before &amp; After-school programs</li> <li>• Homeschools</li> </ul>

Through hands-on science and art activities, learners explore **plant life-cycles**. Each lesson hones **observation** and **problem-solving skills**, while building **confidence** and **creativity** as students create botanically-inspired works of art.

🔄 refill kit available

**TECH REQUIREMENTS / PREREQUISITES**

- None

**PRICING OPTIONS**

- Complete Program: \$995<sup>00</sup>
- Curriculum Print & Digital: \$425<sup>00</sup>
- Refill Kit: \$580<sup>00</sup>



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# Flying and Floating Seeds

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## SCHEDULE

- Introduction (10 min.)
- Flying Seed Engineering Challenge (25 min.)
- Wax Resist Dispersal Art (20 min.)
- Wrap Up (5 min.)



## MATERIALS

- Seed Dispersal Poster
- 18 Deli Containers (3 per group)
- Art paper (1 sheet per learner)
- Bean seeds (1 per pair of learners)
- Brushes (1 per learner)
- Crayons—colored (1 set per group)
- Crayons—white (2 per group)
- Cardstock paper (1 sheet per pair of learners)
- Pencils (1 per learner)
- Scissors (1 per learner)
- Tape
- Watercolor concentrate
- Daily Slides
- Video: [The Sea Bean—Globalzoo](#)
- Video: [Seed Aviation, Travelling, The Private Life of Plants—ATstudent](#)



### DAILY PREP

Test your technology and load the Daily Slides ahead of time, making sure the volume works. Gather all the needed materials, so they are ready to be distributed. For both of today's activities, learners work in small groups and pairs to share materials.

#### Flying Seed Engineering Challenge:

Figure out how you will have learners test their flying seed designs. Several options are outlined in the step-by-step instructions for the activity. It may be helpful to create your own and test out your setup before doing it with your learners.

#### Wax Resist Dispersal Art:

If possible, create finished examples of the activities ahead of time for learners to reference as they work through the tasks. This will help them envision a finished product and help the instructor prepare for any problem-solving challenges learners encounter along the way.

Set up wax-resist materials so you can quickly demonstrate without taking time to collect materials. Create a drawing sample ahead of time so you can demonstrate the steps for learners one step at a time. It is helpful to demonstrate the wax-resist method by drawing with white crayons. When you paint over the wax lines, the image magically appears.

Learners can share paint containers, but they will all need their own paintbrush and a paper towel when it is time to paint. You will need to dilute the watercolor concentrate by mixing one part concentrate with two parts water for the "water" paint and three parts water for the "air" paint in each pair's small plastic tubs. This can be done in advance of the lesson or you can have learners help at the beginning of the activity.



### OBJECTIVE

Explore seed dispersal by completing an engineering challenge and creating a wind dispersal or water-dispersal inspired watercolor piece.



### STEAM CONNECTIONS

Life Sciences

Technology: Innovative Design

Engineering Design

Visual Arts

## ALIGNED STANDARDS

#### International Society for Technology in Education (ISTE) Standards for Students:

- 1.4.c Prototypes: Students develop, test and refine prototypes as part of a cyclical design process.

#### National Core Arts Standards (NCAS):

- VA:Cr1.1.4a: Brainstorm multiple approaches to a creative art or design problem.
- VA:Cr2.2.5a: Demonstrate quality craftsmanship through care for and use of materials, tools, and equipment.

**Next Generation Science Standards (NGSS):**

- NGSS 4-LS1-1: Structure and Function
- NGSS 5-LS2-1: Modeling Cycles of Matter
- NGSS MS-LS2-2: Explaining Interdependent Relationships in Ecosystems
- NGSS MS-ETS1-2: Engineering Design
- NGSS MS-ETS1-3: Engineering Design

**21<sup>ST</sup> CENTURY SKILLS**

- Creativity and Innovation
- Problem Solving
- Flexibility and Adaptability

**HABITS OF MIND**

- Creating, Imagining, and Innovating
- Persisting
- Thinking Flexibly

**KEY TERMS**

**Buoyant:** able to stay afloat or rise to the top of a liquid or gas.

**BACKGROUND INFORMATION****Wind Dispersal (also known as anemochory)**

If you have ever blown on a dandelion head and watched the seeds float away, you have seen wind dispersal in action. Seeds from plants like milkweed, dandelion, poplar and silk floss are light and have feathery or hair-like bristles and can be carried long distances by the wind. Some plants, like ash, sycamore and maple trees, have “winged” seeds. They don’t float away but instead fly or flutter over a distance before falling to the ground. With wind dispersal, the seeds are simply blown about and land in all kinds of places. To help their chances that at least some of the seeds land in a place suitable for growth, plants that rely on wind dispersal often produce lots of seeds and tend to grow in open landscapes like grasslands and mountaintops.

**Water Dispersal (also known as hydrochory)**

Many plants that live in or near water have seeds that use water as a means of dispersal. These seeds float away from the parent plant. Plants that use this method have special adaptations to help their seeds float, including buoyancy (lightweight and have air-filled spaces or fibrous husks that help them float), waterproof coating (a hard outer shell that prevents water from soaking in and damaging them) and slow germination (can survive for long periods in water before finding a suitable place to grow). For example, seeds from mangrove trees are bean-shaped, float on the surface of the water and are carried away by the tide until they wash up on the ground where they begin to sprout. Coconut palms produce large buoyant seeds that are capable of floating in the seawater and traveling long distances before they reach a beach and grow a new tree. Some water-dispersed seeds like cattails are small with hairy or feathery structures that are light enough to sit on the surface of a lake or river until they reach a good area to begin growing.



### Wax Resistance Facts

The wax-resist art method is a technique used in ceramics as a way to mask off areas of the clay surface to keep them from being glazed or stuck to the kiln shelf. The wax-resist method is also used in surfing. Surfers wax their boards to help repel the water so they can better grip their surfboards with their feet. It is also used in decorating fabric in the form of batik. Batik art has a long history in Eastern cultures, with designs drawn on fabric with special tools made to handle hot wax. After the wax cools, the fabric is soaked in a dye bath or dye is painted over the fabric by hand. Once the dye has been applied, the wax is heated and removed, leaving behind soft fabric with gorgeous designs. For more information on batiks, visit:

Website: What is Batiik—The Batik Guild  
<https://www.batikguild.org.uk/batik/what-is-batik>

### Watercolor Basics

Light colors are achieved by adding more water to the paint in a mixing tray or the lid of the paint set. Dark colors are created by using less water. To achieve a darker color it may be helpful to dry the brush off with a paper towel before dipping it into the wet paint. A paper towel can also be used to create texture by blotting the painted surface of the paper, or it can be used to clean up drips and mistakes. If using a paper towel to blot, remember not to rub—this can tear the canvas.

## STEP-BY-STEP DIRECTIONS FOR INSTRUCTORS



### Whole Group

#### INTRODUCTION

Welcome learners back to *Plants and Seeds*. This lesson will conclude their investigation of the diverse ways that plants have adapted to disperse seeds, beginning with a video on water dispersal and a short introductory discussion.

Play the video on the Seed Dispersal—Water slide.

Video: The Sea Bean—Globalzoo

<https://www.youtube.com/watch?v=7UTWMhFhMFc>

How do the water-dispersed seeds we saw in the video differ from the exploding or self-dispersed seeds we saw in action last time? (They fall off the tree, rather than being propelled out. They are bigger and have special adaptations that allow them to float for a long time in the water.)

We'll see a few more examples of water-dispersed seeds later on, but what they all tend to have in common is the fact that they are buoyant—in other words, they can float.



### Pairs

#### FLYING SEED ENGINEERING CHALLENGE

To transition to the Flying Seed Engineering Challenge, play the video on the Seed Dispersal—Wind slide.

Let's watch a short video on seed dispersal. This will give you a good idea of how seeds travel on the wind.

Video: Seed Aviation, Travelling, The Private Life of Plants—ATstudent

<https://www.youtube.com/watch?v=2rX--Y5gCnE>

Show learners examples of wind-dispersed seeds in the following slides. To get learners' creative juices flowing, click through the Seeds with Wings and Seeds with Hairs slides, which have examples of wind-dispersed seeds.

Let's look at some more examples of seeds that use the wind to move. Many seeds have fluffy, hair-like structures, which make the seeds bigger so the wind can catch them without making the seeds much heavier.

Learners work in pairs to design a seed that could effectively be dispersed by wind.

Pass out supplies: Each pair will need one bean, a sheet of cardstock, pencils, scissors and tape.

While learners are beginning to work, you can leave a few pieces of tape on the edge of each pair's desk or table, then hand out more as needed. If you have other craft supplies available (tissue paper, string, pipe cleaners, etc.), you can put these out for learners to use as well. Keep one of the slides with images of wind-dispersed seeds up as inspiration while they work.

There are a couple of different ways you can have learners test their designs. Pick the variation that makes most sense for your situation:

- If you have access to a staircase or balcony, learners can drop (not throw!) their seed and either count the number of seconds it takes to hit the ground or see how far forward it travels before touching the floor.
- If you would prefer to stay in the classroom, you can use a fan to simulate the wind. Learners can let go of their seed from a designated point in front of the fan and measure how far forward it flies before hitting the ground.
- If you don't have access to somewhere high up or a fan, you or another instructor can stand on a step stool or chair, raising your arm high, then dropping the seed. Measure the distance traveled or time in the air.

Depending on time, you can either encourage learners to test their designs on their own when ready, then revise as needed, or do the testing as a whole group, then allow learners to go back to their small groups to revise and retest. Encourage pairs to compare their design and results with another pair before starting revisions.



### Individual

## WAX RESIST DISPERSAL ART

Pass out the art paper, pencils and crayons and explain the project. If you created a sample, display it for learners so they can envision how the wax resist will turn out.

Now it's time to paint a plant that disperses its seeds by either wind or water. But this isn't any ordinary painting. We're using watercolors and some wax magic. To begin, lightly draw on the watercolor paper with a pencil first, sketching out your plant and seed of choice. Your painting doesn't have to look exactly like your drawing. You can make changes and add any details you want.

Once sketches are complete, demonstrate how the wax-resist method works by modeling with both the white and colored crayons and paint.

- Note that the pencil will show through under the white crayon, so learners will want to erase any pencil marks before drawing over the top of them with the crayon. Colored crayons will also resist paint but won't pop as much as the white crayon. Encourage learners to press down hard so that the wax goes on thick.
- Demonstrate how to dilute the watercolor with water to adjust how dark the paint is. If learners are painting a wind-dispersed plant, they should use more water to create a lighter blue color for the sky; if they are painting a water-dispersed plant, they will want to use less water so the paint is more concentrated and yields a darker color blue to represent water in their piece.

## STEP-BY-STEP INSTRUCTIONS: WAX RESIST DISPERSAL ART

1



Draw your plant and seed of choice with crayon. Press down hard so there is plenty of wax. Use white crayon for anywhere you want to stay white. Don't color in the sky or the water!

2



Use water to dilute the watercolor concentrate. Use more water for light blue and less water for dark blue.

3



Do a small test patch; if the color is too light add more watercolor concentrate.

4



Paint the sky with the lighter blue. You can paint over the areas where you drew with crayon, the wax will resist the paint!

5



Paint any water in your picture with the darker blue.

6



Put your work somewhere safe (and flat) while it dries! The color will be slightly darker once dry.

Pass out brushes and deli containers with a small amount of liquid watercolor in the bottom. Each group should have two containers, so they can create a more diluted “air” colored paint and a less diluted “water” colored paint. Have a volunteer from each group come to you to get a cup of water to bring back to their table, then work with their group members to create their perfect shades. Encourage them to add a very small amount of water at a time and do a test patch before adding more—the color may look darker in the container than it does on their paper. If too much water is added, you can add an additional drop or two of watercolor for them.

Then break learners into individual work time. Circulate the room and help during project work time, encouraging everyone to share ideas.



### Whole Group

### WRAP UP

Have learners clean up their areas and put their finished creations somewhere safe to dry. If there is a sink in the space you are in, ask for volunteers to help with dumping water and rinsing paintbrushes. Rinse and save the deli containers. If you have a couple of minutes to spare, learners can take a look at their seedling’s progress.

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### CHECK FOR UNDERSTANDING

- What adaptations are helpful for seeds that are wind-dispersed?
- What adaptations are helpful for seeds that are water-dispersed?

### EXTENSIONS

#### Seed Mosaics

Use seeds to create a mosaic-style work of art. Using a variety of seeds easily found in most grocery stores (flax seeds, chia seeds, poppy seeds, popcorn kernels, lentils, dried beans, etc.), learners can create a mosaic by either pressing them into air dry clay or using white glue to create their image on cardstock or scrap cardboard. The following tutorials provide step-by-step instructions for each method:

Website: Air Dry Clay Seed Mosaic Craft—Raising Up Wild Things  
<https://raisingupwildthings.com/2023/10/04/air-dry-clay-seed-mosaic-craft/>

Website: Cardboard Snail and Butterfly Seed Mosaics—Wood Lark Blog  
<https://woodlarkblog.com/seed-mosaics/>



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