

NATIONAL GEOGRAPHIC KIDS EDUCATOR'S GUIDE

NEXT GENERATION SCIENCE STANDARDS AND CLASSROOM ACTIVITIES



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A **seed** is the start of a new plant life.
Bury it in soil, and watch it **grow,**

grow,
grow.

A seed is the start

Melissa Stewart

ABOUT THE BOOK

Meet seeds that pop, hop, creep, and explode in this lyrical introduction to plant growth and seed dispersal. Stunning photographs and fact-packed text showcase the role of seed features and functions in creating a new generation of plants. Complete with an illustrated glossary, resources, and an index, *A Seed is the Start* inspires wonder as it encourages budding botanists of all ages to look with new eyes at plants and their seeds.

Themes

 **Plant growth and survival**

 **Plant life cycle**

 **Plant structures**

 **Seed dispersal**

Supports these NGSS Performance Expectations

- 1-LS1-1.** Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
- 2-LS2-2.** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
- 3-LS1-1.** Develop models to describe how organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
- 4-LS1-1.** Construct an argument showing that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Teaching Tips

- ***A Seed is the Start*** utilizes a dual-layer text to appeal to a wide range of age and grade levels. Throughout this guide you'll find activities to use with younger children (kindergarten to grade 2) as well as older readers (grades 3 to 5).
- The two layers of text in this book also make it ideal for Reading Buddy programs, which are now popular in many schools. For more information, please see: <http://www.melissa-stewart.com/pdf/scirdbuddies.pdf>.



Each dandelion seed grows inside a hard, brown nut.

The nut's long stem is attached to a clump of silky hairs. The wind can blow a dandelion seed up to 500 miles (805 km).

Before You Read

Grades K-2

Write the word **seed** on a large index card and place it on the wall in the classroom meeting area. Invite your students to describe a seed. Do they think a seed is alive? What is their rationale?

Next, show your class a piece of chart paper with the following list of words: fly, spin, glide, tumble, spill, splash, float, drift, pop, hop, creep, hook, cling, ride inside, ride outside. After reading the words together, invite volunteers to act out each verb. Then ask your students: ***How do you think these words might be related to seeds?*** Record their responses on chart paper.

All Grades

Divide the class into groups of two or three students and give each group a hand lens and a Velcro strip. Invite group members to take turns looking closely at the Velcro. If students are wearing sneakers with Velcro straps, encourage children to look at them, too. Invite the children to draw and label what they see.

After a few students have had a chance to share their drawings, show your class the photo of the burdock burr on page 24 of ***A Seed is the Start***. Let the class know that Georges de Mestral invented Velcro after noticing burrs sticking to his dog's fur.

When Georges looked closely at the burrs, he saw hundreds of tiny hooks and realized that a similar design could replace buttons and zippers. Later, someone else realized that Velcro straps could replace shoelaces.

Let your class know that hooking onto fur is one way that seeds disperse, or move to new places. Write the word "disperse" on chart paper and ask the class: ***How else do you think seeds might disperse?*** (Encourage K-2 students to think back to the verb-movement activity described above.) After recording the children's ideas, let them know that you're going to read a book about the many different ways seeds disperse.

As You Read

Show students the cover of *A Seed is the Start* and read the title. Then ask your class what they think the title means. Do the photos on the cover provide any clues?

Next, review the vocabulary words on page 3. After you have finished reading page 4, ask your class: **What is a seed the start of?** You may wish to place page 5 under a document camera as you read it, so that everyone can clearly see the early stages of plant growth.

When you've finished reading the main text on page 6, ask the class: **Why do you think a plant needs its own space to grow?** When a few volunteers have suggested reasons, read the rest of the double-page spread to find out.

After reading pages 8 and 9, begin a three-column data table like the one shown below. Continue adding information to the table as you read the rest of the book. Your final data table should look similar to this:

How Seeds Disperse in *A Seed is the Start*

How Seeds Move	Plant(s)	What Disperses Seeds
Fly	Milkweed, dandelion	Wind
Spin	Maple tree	Wind
Glide	Asian climbing gourd	Wind
Tumble	Russian thistle	Wind
Spill	Poppy	Water
Splash	Marsh marigold, living stone	Water
Float	Iris, cottonwood	Water
Drift	Red hamburger bean vine, coconut palm	Water
Pop	Himalayan balsam, sandbox tree	Self
Hop	Wild oat	Self
Creep	Cornflower	Self
Hook	Burdock	Animal
Cling	Queen Anne's lace	Animal
Ride inside	Plant with berries or large, sweet fruit	Animal
Ride outside	Bloodroot, oak (acorn)	Animal

Once you've read pages 30 and 31, invite your class to predict how apple seeds are dispersed. Encourage them to explain their rationale. Then ask: Which example in the data table do you think is most similar to the apple seed's dispersal method? (Ride inside.)

After You Read

Ask your class: ***What do you notice about the format of this book? How is it organized?*** (There are two layers of text. The larger, main text describes seed actions and presents a main idea. The smaller, secondary text provides supporting details.)

Then ask: ***What is the main idea of this book?*** (Plants grow best when their seeds move away from their parent plant, and seeds have many ways of dispersing. Some are carried to new places by wind, water, or animals. Others propel themselves.)

Did You Know?

Bamboo is the fastest-growing woody plant in the world. It can grow as much as 35 inches (89 centimeters) in a single day.

Science Activities

Grade K

Divide the class into pairs and give each group a lima bean that has been soaked overnight. Tell the children that if they cut the bean in half, they'll discover a secret inside. Encourage students to turn and talk with a buddy about what they think is hiding inside the seed.

Now give each group a plastic knife from the school cafeteria. Invite students to carefully cut the bean in half. Ask students to observe the inside of the seed and draw a picture of what they find inside. (They will see a tiny plant.)

Grade 1

Let your students know that sometimes seeds disperse to new places where people don't want them to grow. For example, dandelions are weeds that grow in people's lawns.

Divide the class into four teams—Wind, Water, Self, and Animal. After giving each group an index card with their team name written on it, invite students to look at the data table and choose a plant that disperses in the way written on their index card. Their mission is to design a solution to the problem of unwanted seed dispersal for that plant.

Encourage the teams to brainstorm at least three possible solutions and then choose their favorite one. Each student should draw and label a picture of the group's solution. Allow time for the teams to share their ideas and drawings with the rest of the class.

Science Activities – continued

Grade 2

Divide the class into four teams—A, B, C, and D. Let the students know that each group will brainstorm to come up with the design for a new machine or gadget that can disperse seeds like the dog on page 24 (Team A), the bird on page 26 (Team B), the ant on page 28 (Team C), or squirrel on page 29 (Team D) in ***A Seed is the Start***. The invention should disperse seeds more efficiently than the animal it’s mimicking. After the brainstorming sessions, each student should create a drawing of the group’s gadget. Allow time for the teams to share their ideas and drawings with the rest of the class.

Grade 3

After reading ***A Seed is the Start***, share a book that describes the life cycle of a butterfly, frog, or other animal. As you read, create a data table that compares the stages of growth and development of the apple tree in ***A Seed is the Start*** and the animal in second book. Then invite the class to use the information in the data table to create life cycle diagrams with (1) drawings that show how the plant and animal change over time and (2) descriptions that explain how the plant and animal are “born,” how they grow, and how they reproduce to create more plants and animals even after the original individual dies.

Did You Know?

In 2012, scientist in Russia found 32,000-year-old seeds. They had been buried by an Ice Age squirrel. Believe it or not, a few of the seeds grew into new plants with small white flowers.

Science Activities – continued

Grades 4-5

During a planning period, create a worksheet with a data table that lists all the plants in ***A Seed is the Start*** (column 1) and how the seeds are dispersed (column 2). Students will work in pairs to complete column 3 (Plant Part that Helps) using information from the book. Be sure to let the class know that, in two cases, the book does not have sufficient information. Their completed worksheets should look similar to this:

Plant(s)	Dispersal Method	Plant Part that Helps
Milkweed	Wind	Seedpods pop open
Dandelion	Wind	Silky hairs on fruit (nut) catch the wind
Maple tree	Wind	Fruit spins like helicopter blades
Asian climbing gourd	Wind	Fruit cracks open
Russian thistle	Wind	Stem breaks away from roots, plant tumbles across ground
Poppy	Water	Fruit has holes, stem sways in wind
Marsh marigold	Water	Seedpods split open
Living stone	Water	Seedpods burst open
Iris	Water	Seedpods break open
Cottonwood	Water	Fruit splits open
Red hamburger bean vine	Water	Seedpods split open
Coconut palm	Water	Fruit floats
Himalayan balsam	Self	N/A
Sandbox tree	Self	Fruit explodes
Wild oat	Self	N/A
Cornflower	Self	Bristles on fruit shrink and swell, moving seed across ground
Burdock	Animal	Fruit's spiky covering (burr) gets caught on animal fur, fruit splits open
Queen Anne's lace	Animal	Fruit's sticky spines clings to animal fur
Plant with berries or large, sweet fruit	Bird, deer, bat	Sweet fruit attracts hungry animals
Bloodroot	Ant	Food packet on seed attracts ants
Oak (acorn)	Squirrel	Fruit (nut) attracts squirrels

Science Activities – *continued*

Grade 4-5

Now invite each duo to join with one or two others to create four groups—Wind, Water, Self, and Animal. After giving each group an index card with their team name written on it, invite students to choose a plant from their worksheet that disperses in the way written on the index card. Students will pretend to be a seed from that plant and write a letter to a seed that disperses in the following way:

Wind disperser ➡ Water disperser

Water disperser ➡ Self disperser

Self disperser ➡ Animal disperser

Animal disperser ➡ Wind disperser

Each letter should explain (1) how the seed is dispersed, including what plant parts help it move, and (2) why they think their dispersal method is best, including potential problems with other kinds of seed dispersal. Allow time for volunteers to share their letters with the rest of the class.

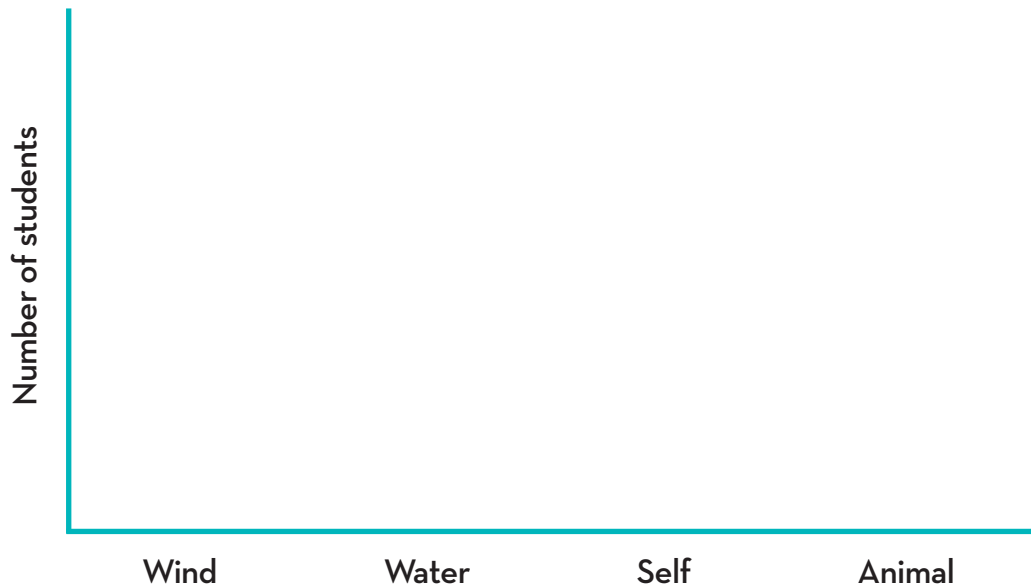
All Grades

Provide students with a plastic cup, some potting soil, and a bean seed so they can observe a plant's various life stages as they occur. Encourage the children to measure and record the plant's changes in height and document the changes in its overall appearance.

Additional Activities

Grades K-2

- After reviewing the information in the data table (See page 8.), encourage students to pretend they're a seed. Invite them to draw a picture on an index card showing how they would most like to be dispersed. While the class is working, create a graph like the one shown below on a blank wall or bulletin board.



When the students are ready, help them add their index cards to complete the bar graph. Ask the class: *Which seed dispersal method is most popular in our class? Which is least popular?* Select two or three items from the horizontal axis and invite student volunteers to explain why they would (or wouldn't) want to be dispersed in those ways.

- Working in small groups or as a whole class, use the letters in SEEDS DISPERSE and the information in the data table to generate an acrostic poem about how and why seeds travel to new places.

Additional Activities – *continued*

Grades K-2

- Invite students to draw a picture of one kind of seed dispersal that surprised them. After showing the class a few sample postcards, encourage them to turn their papers over and draw a line down the center, so that it looks like the back of a postcard. On the left-hand side, they should write a note from the seed they drew to its parent plant. The note should include a description of:
 - the seed's journey, including what it saw along the way
 - the place where the seed landed, including whether it's a good spot

On the right-hand side, the students can add an appropriate address for the parent plant and draw a postage stamp.

Grades 3-5

Gather several kinds of seeds, label them, and place them in your classroom Science Center. Allow time for small groups of students to rotate through the Science Center, observe the seeds with a hand lens, and predict how they might disperse.

When everyone has completed this task, invite each team to choose two seeds and do some research. They should look for (1) how the seeds really do disperse and (2) important characteristics of the plants they will become. Then, encourage each group to use words and pictures to create a double-page spread about the seeds and plants, using the format of *A Seed is the Start* as a model.

Additional Activities

All Grades

Search online for time-lapse videos that feature some of the seed dispersal methods discussed in *A Seed is the Start* and share them with your class. Then divide the class into small groups and invite them to discuss the following questions:

- *How did seeing the videos help you understand the dispersal process better?*
- *Did you see anything that surprised you? If so, what?*

When the groups seem ready, record each team responding to the questions with the video setting on a digital camera. Later, you can use a simple video editing program to create a class video.

Related Reading

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Melissa Stewart is the award-winning author of more than 180 books for children, including eleven National Geographic Readers. Her picture book *Feathers: Not Just for Flying* was an ALA Notable Book and winner of the Cybils Award for Nonfiction and the Nerdy Book Club Award for Nonfiction. *No Monkeys, No Chocolate* was a Kirkus Best Books of 2013 and NSTA Outstanding Science Trade Book. *A Place for Turtles* won the Green Earth Book Award. Melissa holds degrees in biology and science journalism and is also the co-author (with Nancy Chelsey) of *Perfect Pairs: Using Fiction & Nonfiction Picture Books to Teach Life Sciences*. She speaks frequently at conferences for educators and is available for school visits. www.melissa-stewart.com