

Pollen Transfer and Pea Plants

By Christine Anne Royce

While students may have considered that traits are passed down from one generation to another in animals and people, they may not have considered that traits and variation in species occur in plants. In the investigation for primary students, the focus is on how the external characteristics such as color and shape help flowers attract insects and birds, which helps in pollination. Students in the intermediate grades engage in an investigation that involves careful observation and plant characteristic tracking similar to what Mendel did in his famous pea plant experiment.

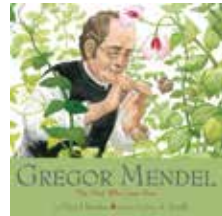
This Month's Trade Books



Flower Talk: How Plants Use Color to Communicate
By Sara Levine
Illustrated by Masha D'Yans
ISBN: 978-1-5415-1928-2
Millbook Press
32 pages
Grades 1-3

SYNOPSIS

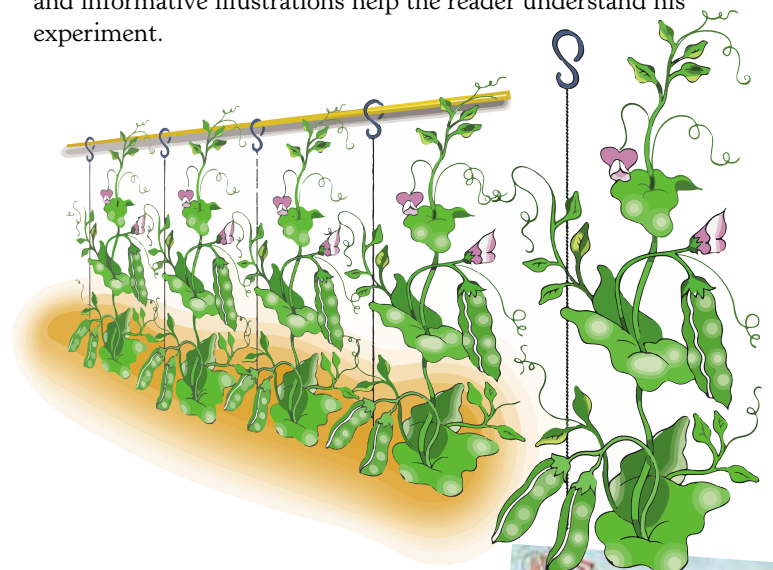
Did you know that plants communicate? A cactus with an attitude narrates this story that explains how a plant uses structure, color, and odor to communicate with different animals. Vivid illustrations accompany text that helps to paint the picture for student understanding.



Gregor Mendel: The Friar Who Grew Peas
By Cheryl Bardoe
Illustrated by Joseph A. Smith
ISBN: 978-1-4197-1840-3
Abrams Books for Young Readers
32 pages
Grades 3-6

SYNOPSIS

This biography of Gregor Mendel explains both parts of his life and his life's work—understanding inheritance of traits. Included within the story is how he became interested in inherited traits as readers are introduced to his famous experiment of tracking the different traits of peas. Descriptive text and informative illustrations help the reader understand his experiment.



ADDITIONAL BOOKS

Gray, R. 2015. *Flowers are calling*.
Boston: Houghton Mifflin
Harcourt.

Kaner, E. 2020. *Pretty tricky: The sneaky ways plants survive*.
Ontario: Owlkids Books.



Grades K-2: Calling All Pollinators

PURPOSE

Students will observe how pollen is transferred from one flower to another by different birds and insects by engaging in simulated activities. Students will also explain how plants use color, structure, and odor to attract animals.

ENGAGE

Begin by asking students to examine several different photos of flowers along with the types of animals that are pollinators for this type of flower (see Supplemental Resources). Make a list of the different student responses when you ask, “What do you notice, what do you wonder?” about the plants and animals. Dive a little deeper into student answers that discuss the color of the different flowers and that animals help other flowers grow. Share the cover of *Flower Talk: How Plants Use Color to Communicate* to students and ask them to continue to add to their wonder and notice list. Read the first six pages of the book to the students and stop at the “that’s why we need animals” page. Ask students to revisit the wonder and notice list and identify any of the points they made that are related to the fact that animals help plants grow.

EXPLORE

Different animals or insects help to pollinate different flowers and plants, which allows them to reproduce by transferring pollen from one plant to another. Introduce the question that will be the focus as students explore the following investigation: *How do color and shape help attract different pollinators?* Allow students to use the different stations described below (or engage them in one investigation at a time if easier) to explore how pollen can be transported from one plant to another by an animal or insect. See the teacher notes on how to set up each station ahead of time (see Supplemental Resources). There are task cards for each of the stations to help the students.

MATERIALS

- *Flower Talk: How Plants Use Color to Communicate*
- I’m a Pollinator student sheet
- Flowers Talk student sheet, flower pictures with pollinators, flower pictures without pollinators, teacher directions for stations, student station task cards (see Supplemental Resources)
- straws, tissue paper squares (4" × 4"), two different color tempera paints, pipe cleaners, bottle caps, coffee filters, cotton beauty squares, cotton balls, pompoms (2-3"), and a small sauce cup

Station #1: Sipping nectar – One of the ways that pollen can be transferred from one flower to another is when sticky pollen adheres to the side of a bird’s beak as it is sipping nectar. When a bird such as a hummingbird visits the next flower, some pollen is transported and transferred to that flower. Using a shortened straw, demonstrate for the student how to place the straw into the flower as if they were a hummingbird sipping the nectar. When they remove the straw from the flower, ask students to notice what happens to some of the pollen grains and record their answer on their I’m a Pollinator Student Sheet (see Supplemental Resources). Repeat this process by having students move to a different flower and repeat the process and make additional observations.

Station #2: Landing on a platform – Butterflies are often drawn to flowers of many different colors and prefer flowers that have a shape that allows them to land on a flatter surface. As butterflies move around the flower sipping nectar, pollen grains stick to their legs and body. Ask students to use their butterfly model to



lightly land on the flowers provided, move around as if they were a butterfly on the flower, and make observations of what happens to the pollen. Have them record their observations and then land on a different flower and repeat the process of making observations. In this investigation, it will be easy to see that pollen is transferred since the pollen is a different color than the flower on which they are landing.

Station #3: Pollen Collecting – Bees have a specialized structure on their legs that help them to collect and store the pollen in order to take it back to the hive. However, some of the pollen grains are transferred to different flowers the bee visits. Have the students use a cotton ball to land on one of the flowers, then take off as a bee would, and land on a different flower. Ask students to make observations about what happens at each part of the process and record the observations.

EXPLAIN

After students have had a chance to participate in each investigation, ask them to share their observations. Engage them in a discussion with the following questions: How do these investigations connect to the beginning of *Flower Talk: How Plants Use Color to Communicate*? What represented the pollen in each of the station investigations? What did you notice happened to the pollen when you moved from one flower to another flower? Why do you think this is important for the flowers? Return to the story and finish reading the story from page 7 forward, stopping at the following points for discussion. Where possible, connect the story back to the student's observations.

p. 8: What does the word *advertise* mean? Can you provide an example of an advertisement? Why do you think the author says that the flowers advertise that they are there? What part of a plant attracts attention?

p. 12: Why is the color of a flower important?

p. 16: What do bees collect from flowers? What do birds, bees, and other insects help move from flower to flower? How do they transfer some pollen to other flowers? What did you observe during the investigations that make a text-to-investigation connection?

p. 20: What helps moths and bats locate white flowers in the dark?

p. 24: What is another way that pollen can be moved from one flower to another?

p. 26: In addition to color, what is another feature that helps to make flowers attractive to insects such as butterflies?

Once you have finished reading the story, ask the students to complete the following prompts that help them make connections.



Text to Self – In the story, the narrator tells the reader that flowers “advertise” to the animals and insects they need to help them survive and produce more flowers. Is there a time when you saw an advertisement that grabbed your attention? What about the advertisement did you like?

Text to World – Share a time when you’ve seen a bird or insect on a flower. Do you remember what color the flower was? What type of insect? How do you think we could encourage different insects like butterflies to visit our yards?

Text to Investigation – Can you connect an example in the story to something you did or observed in one of the investigations?

ELABORATE

Remind the students that the narrator asked them if they would do him a favor and “tell the other humans about what makes flowers attractive to pollinators” and how they need to help. To do this, provide students with a variety of different flowers or pictures of different flowers (see Supplemental Resources) and ask the students to look at the color and shape of the flowers at first. Have the students think about what type of pollinator would be attracted to this flower and why. Ask the students to create an informational poster that tells other humans about what they have learned about how flowers talk to different animals and how that information is communicated using the Flowers Talk Poster template (see Supplemental Resources).

EVALUATE

Students first make observations and ask questions about the flowers and different pollinators. Students are then asked to make observations and draw inferences about how different animals transfer pollen from one flower to another through activities that simulate different ways pollen is transferred. Finally, through discussion and the creation of an poster, students are demonstrating their understanding of the importance of flower color and shape in attracting pollinators and communicating it to others.

Grades 3–5: Mendel’s Peas

PURPOSE

Students will examine different characteristics of pea plants that are inherited similar to Mendel’s famous experiment and then compare different types of plants as they grow in different environments.

ENGAGE

Begin by showing students four different types of apples and ask the students if they can identify similarities and differences. Ask them to also consider questions that they have regarding the apples and why they may be similar or different. Read through page 12 of *Gregor Mendel: The Friar Who Grew Peas*. Point out the following excerpts to the students.

p. 1: “The people of Gregor’s village had learned that growing two kinds of apple trees together could produce better fruit and that breeding two kinds of sheep together could yield thicker wool.”

p. 12: “How do mothers and fathers—whether they are apple trees, sheep, or humans—pass down traits to their children?”

After the first point, engage the students in a discussion about why growing trees that produce better fruit or sheep that grow thicker wool would be positive. Ask the students if they know what *traits* are and how the apples they began the discussion with have similar and different traits.

EXPLORE

Continue to read the story to the students through page 16 and ask students to name some of the other types of plants that scientists had used to produce hybrid plants. What characteristics or traits did Mendel look at in his pea plants (Figure 1)? Mendel identified seven different traits associated with pea plants that appear in one of two different varia-

MATERIALS

- *Gregor Mendel: The Friar Who Grew Peas*
- different varieties of pea seeds, (containers, trellises, soil necessary to grow peas according to package directions)
- Pea Trait Observation Sheet (see Supplemental Resources)



tions. In other words, they do not mix. Those traits are: the flower color is either purple or white; the flower position is either axil (where they grow in the middle of a stem) or terminal (where they grow only at the end of the stem); the stem length is long or short, the seed shape is round or wrinkled, the seed color is yellow or green, the pod shape is inflated or constricted (where the peas can be seen as bumps in the pod); and the pod color is yellow or green. As some varieties of peas can take up to two months to produce pea pods, the teacher can help to expedite this investigation by starting the pea plants ahead of time. It is important to keep track of which pea plant came from which packet of seeds. Students can be making observations about the plants long before they engage in this particular lesson and connect it to different variables in investigations, asking questions, collecting data, and other scientific practices.

Provide the students with a Pea Trait Observation sheet (see Supplemental Resources) for them to record their observations on as they explore different traits. (Teacher note: They are only making observations of characteristics and traits; students will not predict traits or determine probability of inheritance.) Using small planting containers, ask the students to first make observations about the shape and color of the

FIGURE 1

Pea characteristics.

Characteristics of pea plants Gregor Mendel used in his inheritance experiments						
Seeds		Flower colour	Pod		Stem	
form	cotyledons		form	colour	position of inflorescences	size
round roundish	yellow	white	full	yellow	axial	long
wrinkled	green	violet-red	constricted between the seeds	green	terminal	short

seed before they plant it and note it on their student sheet. If plants are started early, keep some of the pea seeds available for them to examine. As the plant starts to grow, ask the students to make observations about the other traits, which include flower color, where the flower is located, the shape and color of the pea pod, and the length of the stem. They should be recording the information several times per week once the pea seed has germinated.

There are three main varieties of peas (garden, snow, and snap) with different types under each variety. To have students be able to observe different traits, the following are the recommended varieties/types to use for growing, and the recommended seed producer is Burpee seeds (see Online Resources). Other brands can be used, but the teacher should make sure that the peas being selected have different traits.

- Sugar Snap Peas (Snap Peas) – these peas grow to be about 6 feet tall.
- Snowbird Peas (Snow Peas) – these peas grow to be about 1.5 feet tall.
- Garden Sweet Peas (Garden Peas) – these peas grow to be about 2 feet tall.
- As some pea plants have been crossbred to create hybrids, teachers can add in the following pea varieties to encourage additional questions from students.
- Purple Podded Peas – these peas have dark purple flowers and dark purple pods.
- Sugar Magnolia Peas – these peas have purplish pods and two-color flowers.

Continue to read the story to the students beginning at page 17, where it describes how he conducted his experiments. Ask students to compare their process to Mendel's process and why he kept the pea flowers covered after hand pol-



inating them? While students are waiting for the plants to mature, they can continue to read more about Mendel's Pea Experiments and other plants that have been cross bred to produce different traits. Possible ideas would be lilies, apples, and tomatoes.

EXPLAIN

Ask the students to report on their observations about the pea plants on a regular basis and make comparisons between the different plants and their traits. For example, students can begin to look at the difference between the pea seeds (color and surface) and then once the plants have started to grow, look at the height of the plants. Do not allow students to draw correlations or connections between these characteristics since that requires a deeper understanding about genetic probability. This will allow students to continue to be



engaged in the process of making observations as the plants grow. Ask the students to compare their characteristics to the ones that Mendel picked and are explained on page 15 of the book. Why did he choose the traits he did, and what was he going to do to keep track of the traits? Ask students to compare his process with what they are doing in their investigation. Are students seeing different traits than he did? Continue to read the story to the students and ask them to summarize what he found with the children or offspring of the plants and then with the grandchildren. Ask the students to look at the apple varieties that they had started with for this explanation and connect the different types of apples to what they understand about Mendel's experiments.

ELABORATE

Ask students to make a list of other traits that they think are inherited from a parent or passed through inheritance to an offspring for a plant and questions they have about inherited traits in plants. If possible, invite a farmer, greenhouse manager, flower grower or other person who grows and breeds plants to speak to the class about how inherited traits are researched and the different varieties of plants that are then produced. In addition to having the speaker discuss inherited traits, have the students redo growing one particular type of pea that they select and change an environmental factor such as the amount of water or sunlight it gets, how much space



it has to grow by using different size pots, or other environmental factors that the students can think of such as temperature. Have the students compare their findings from the first round of growing peas to the second round of growing peas. Ask the students to describe and explain how the environment influenced the pea plant.

EVALUATE

Students first demonstrate their ability to compare and contrast objects that they are familiar with and have similarities and differences before connecting that to making observations about different traits that pea seeds and pea plants have similar to Mendel. Throughout the growing of the pea plants, students are asked to connect their investigation to that of Mendel's and note where they are performing similar tasks and where the investigations differ. Finally, students are considering how environmental factors can also impact the traits of a plant.

ONLINE RESOURCES

Burpee Seed Catalog
<https://www.burpee.com/vegetables/peas/>
 Characteristics of pea plants (public domain image)
https://commons.wikimedia.org/wiki/File:Gregor_Mendel_-_characteristics_of_pea_plants_-_english.png

SUPPLEMENTAL RESOURCES

Download activity materials for K-2 at <https://bit.ly/3cWDHbA> and 3-5 at <https://bit.ly/3cSE8nj>.

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