CRS
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1611 San Pablo Avenue, Suite 10 B
Berkeley, CA 94702
(510) 527-5212 | www.crscience.org

SCATTERING SEEDS: SEED DISPERSAL – Grades K-2

Overview: By observing seed characteristics and designing and testing a model of an animal dispersed seed, students will discover that seeds are dispersed in a variety of methods, that the features of the seeds are related to how they are dispersed, and that the surrounding environment can influence how seeds are dispersed.

Quick summary:
1) Students think about and discuss why seeds disperse
2) Students observe a variety of seeds to explore structures associated with different dispersal modes
3) Using their observations of seeds, students build and test seed models for dispersal by animals
4) Students have the opportunity to improve their design

Grade Span: K-2 Grade (adaptable for older grades)

Time: Approx. 60-100 mins* (30-40 mins for observation/discussion, 30-60 mins design/build/test model) *can be split into 2-3 days

Learning Goals:
Students understand that
- different seeds disperse in different ways (water, wind, animals (on fur, in gut, carried), mechanical/explosive)
- unique characteristics of a seed help make dispersal successful
- the surrounding environment affects how seeds are dispersed
- it is advantageous for a seed to disperse away from its parent

Students combine their new knowledge of these unique characteristics with the principles of engineering to develop and test their own model of an animal dispersed seed.

Materials:

For seed introduction: (5 types for each of the dispersal methods)
- Water: coconut (seeds that float or that commonly grow in or on the edge of water - others include lotus, water lily, mangrove, cat tail)
- Wind: maple, ash, dandelion, milkweed, grasses (seeds with wings/helicopters)
- Animal, burr: burdock, foxtail (seeds w/ hooks, or rough/sticky surface)
- Animals, eaten or carried: cedar, watermelon, pumpkin, berries, tomatoes (fleshy fruit that is eaten, seeds that are buried by animals)
- Mechanical/explosive: poppy, jewelweed, wisteria (fling mechanism, pods that explode) (**Colored images may work as a substitute if necessary, esp for mechanical which are hard to find)

For model building
- Dried beans (kidney beans work well, or if you want something larger for little hands you can use dried lima beans)
- Tape – masking and scotch
- Toothpicks
- Paperclips
- Paper
- Cotton balls
- Popsicle sticks
- Scissors
- Packing peanuts (they are good for sticking things into)

For model testing

- Create a small furry animal by wrapping fuzzy fabric around a coffee can (a Swiffer dusting mop sheet works really well)

Groupings: Whole group for introduction, small groups for observation of seed types, individual or pairs for making seed models.

Vocabulary:

fruit	wind
seed	animal
dispersal	hitch-hiker
germination	model
float	(adaptation)

Introduction

Hook/engage: Show the class/pass around a variety of fruits that have been cut in half (to expose the seeds). Real fruit is best, but pictures could be used here. Ask students what all of them have in common (seeds).

Activate Prior Knowledge:

Group discussion:

-Why are seeds important? What is their purpose?

-What would happen if I planted a seed?

-Where else have you seen seeds before (park, backyard, other fruits/veggies, flowers, etc.)

-How do seeds get to those places?

→ Discuss that humans plant seeds to grow plants, but nature and plants also have ways of spreading seeds around to grow more plants.

→Introduce the word dispersal – write on vocab wall

Think-Pair-Share: Why is it valuable to a plant to move its seeds? Why might it not be a great idea to plant a bunch of seeds in the same place?

Today we are going to learn how seeds get dispersed or spread around an area.

-Think-Pair-Share what are some ways seeds might get dispersed?

Activity

Procedure:

1. Observation of seeds (5 stations, 5 mins at each station = 25 mins)
   Guiding question: what features of these seeds/fruits might help them disperse?
   a. Set up 5 centers (see materials), each featuring a different type of seed dispersal. Divide class into 5 groups. Groups will rotate through the 5 centers and observe the seeds for each dispersal type. You can also provide a magnifying glass/microscope, and some water in a tub of water to help them explore the features of the seeds. While at each station, students should draw a sketch of the seed in their notebook and note interesting/unique characteristics (shape, size, etc.) that they think might help with dispersal. Depending on their writing levels, students can write observations or complete the sentence frame "I think this seed is dispersed by _____ because _____".
   b. Rotate students every 5 minutes. Teacher should guide student observations by asking questions to help students extend their thinking, helping them notice and describe the features of the seeds, and to work out their thinking about dispersal modes.
2. Wrap up for part 1
   a. What did you observe about the seeds? Any interesting characteristics?
   b. Go through the collection of seeds from the observation activity and ask, how students think each of these types of seeds are dispersed and why (i.e. what features help it to be dispersed that way)? Try to bring together structure and function.

3. Model building (30 mins)

a. Demonstrate how a "hitch-hiker" seed disperses by rubbing or placing the seed on a fabric surface where it sticks (you can use the fur/fabric covered can described in the materials section). Ask students what are the unique characteristics that help it successfully stick to the "animal". You can also talk about personal experiences with hitch-hiker seeds on dogs or socks.
b. Introduce challenge by explaining that each student will take a bean/seed and use the variety of materials provided to make it stick to the "animal", using the information they learned by observing features of seeds that stick.
c. Show them the materials and give them time to think of a design for their seeds. If they are able, have the students draw a design in their notebook. This is a good time to talk about engineering (challenge, criteria, constraints).
d. Pass out materials and start building!

4. Test designs
   a. Have students see if their seed sticks to the furry animal. They can rub the seed on the fur/fabric covered can or roll the fur/fabric covered can over their seed. To see how effective their design is, students can walk the fur/fabric covered can across the room or shake it for 10 seconds to see if the seed stays attached.
5. Redesign/design adjustment
   a. Have students adjust and retest their designs to make the seed stick better/longer.
   b. If you don't have time or redesign and retesting, have students discuss how they would improve their designs and what test result would show that it improved.

Debrief:

Ask the following questions

- What design was the most successful? What features allowed it to stick well or better than others?
- What helped you come up with your design?
- If we were to go outside, what type of seeds would we likely find and why? Where might you find seeds that stick to animals?
- Discuss whether seeds that hold super tight (or never release from the animal disperser) are the best

Assessment:

Formative: Check-in with students during seed observations to determine whether or not they are understanding the connection between structure and function, i.e. how certain characteristics help seeds disperse. You can also check their science notebooks.

Summative- Ask students to respond to this prompt in their science notebooks- which seed dispersal method would work best in a forest and why? Which would be the worst dispersal method in a forest?

NGSS Standards:

Performance Expectations (PE):

K-2-ETS1-1. Ask questions, make observations, gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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.

1-LS1-2. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

Disciplinary core ideas (DCI):

grade 1:

LS1.A: Structure and Function -- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.

LS1.B: Growth and Development of Organisms -- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.

grade 2:

LS2.A: Interdependent Relationships in Ecosystems -- Plants depend on animals for pollination or to move their seeds around.

Cross-Cutting Concepts (CCC): Patterns, Cause and effect, Structure and function
Practices of Science and engineering: Develop and use models, Plan and carry out an investigation, Analyze and interpret data, Design solutions

Extensions:

1. Take the class outside to find seeds around the school (or have students bring seeds in from home as homework). Students can bring them inside and use the same observation methods as before to try and determine how it is dispersed. (This activity can be used as another assessment to determine the extent of students' understanding of types of seed dispersal.)

2. Biomimicry extension-
   How can the features of hitch-hiker seeds be used in a human application?
   Based on observations of wind dispersed seeds, design a flying toy (helicopter, paper airplane, etc.)

3. Explore how humans influence seed dispersal. See accompanying reading. (DCI ESS3.C: Human Impacts on Earth Systems: Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.)

4. 3-5 Grade Adaptations
   a. Students create and test a model of any of the dispersal modes (animal, water, wind, mechanical/explosive). (PE 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.)
   c. Seed dispersal is just one part of the life cycle of a plant – expand on this activity to explore other parts of the life cycles of plants. (3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.)
   d. Groups of students could each be given a different ecosystem (desert, forest, grassland, etc.) and construct an argument that certain plants may thrive or not survive in that system because of their seed dispersal methods. How might environmental changes (flooding, drought, global warming etc.) affect particular seed dispersal plants. (PE 3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.)

e. After exploring structure and function for seed dispersal, examine other plant features and their function. (PE 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.)
f. Build off of this seed dispersal lesson to explore an entire ecosystem. Plants make seeds ---> animals eat the seeds --->animals are consumed by other animals… Students in small groups could then research and construct a model or visual representation of different ecosystems' flow of energy and give presentations to the class. (PE 5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun. Clarification Statement: Examples of models could include diagrams, and flow charts.)