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## Curriculum Connections



### Packaging the Harvest

Sure, your students can replant some of their saved seeds in next year's school garden, but why not share the wealth? They might create a mini-seed business, give packets of home-grown seeds as gifts, or swap packets with other growing classrooms.

Start by having students examine a variety of commercial seed packets and categorizing the types of information they contain: photos or drawings, planting information, packing dates, days to maturity, germination percentages, and so on. The class should discuss which categories to include on their own packets, based on their unique project and audience. Ask, *What else would be appropriate to include (plant histories or a company logo, for instance)?* Once these decisions have been made, the class might divide their labor. Students interested in art and design could submit ideas for logos or seed packet designs. Other students might use seed catalogs or the Internet to find information to

include on packets. Another team could test the viability of their saved seeds (see below). If the seeds are destined as gifts, each student could create his or her own packet, from soup to nuts.

If students plan to sell their products, here are some questions they might consider:

- Should we standardize either the number, volume, or weight of seeds in each packet? If we do it by volume, what unit of measure can we use to simplify packing (a teaspoon, for instance.)
- How much should we charge per packet? Should we consider the cost of materials? Labor? What will we need to charge to make a profit?
- How will we advertise our product's availability?
- How will we ensure quality control?
- How can we ensure that the seeds will germinate well?

**Testing Seed Viability** - Have the class discuss why germination percentages are included on seed packets, then challenge them to determine what percentage of their seeds are likely to germinate. They might place ten seeds of each type on a folded, moist paper towel, roll it up or fold again, and seal it in a plastic bag. After 7 to 10 days, they can open the towel and count the number of live wires, then calculate the germination percentage.

### Living Histories: Growing Heirloom Seeds

Seeds of many of the plants that grace our gardens were deliberately brought here by immigrants. Other plants we enjoy today originated in the Americas and make up the living traditions of Native Americans. Seeds from plants that have been valued over time — for qualities such as flavor, disease resistance, or ability to grow well in a region — and were passed down through the generations, are called *heirloom* seeds. The stories behind these treasures link us to other people and times. Such seeds are also repositories of vital genetic information, which may have been lost without the efforts of seed savers.

Invite your students to explore heirloom seeds and the reasons many gardeners and farmers are devoted to preserving them. They may be inspired to take action by growing some old varieties in the school garden. Consider asking students to share their ideas about the meaning of the word "heirloom" (according to one dictionary, "a valued possession passed down through generations"). Encourage them to conduct interviews to discover whether relatives have family heirloom items, recipes, stories, or yes, seeds, and then uncover the stories behind them. If relatives recall any food plants or seed types, students may want to try tracking down and growing the seeds (see organization links, below).



## Saving Seeds Contents

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Growing heirloom seeds also links nicely with studies of Native North American cultures or Colonial settlers.

If you're inclined to grow heirloom seeds, consider visiting the Web sites of the organizations listed below. You can buy and sometimes swap such seeds through print and/or online catalogs. (Also check commercial seed catalogs for heirloom seed varieties.)

[Native Seeds Search](#)

[Organic Seed Alliance](#)

[Eastern Native Seed Conservancy](#)

[Seed Savers' Exchange](#)

[Southern Seed Legacy Project](#)



### Messing with Mystery Squash

It's quite easy to save seeds from pumpkins and other squash, but they sure can yield some oddball offspring! By understanding a bit about these strange family dynamics, you and your students can either prevent odd fruits from forming, or deliberately create a new mystery vegetable. Of course, patience is required; students won't know what they've created until the seeds they've saved grow into mature plants. Following is what you'll need to know about these insect-pollinated plants.

Different varieties of what we know as squash and pumpkins can actually be divided into three different species. Varieties within the same species will readily be cross-pollinated by insects (mainly bees), and their seeds can produce strange offspring. Plants in different species cannot cross-pollinate so can safely be planted next to one another. Here's the breakdown of species:

- *Cucurbita pepo*: includes acorn squash, crooknecks, delicata, pie pumpkins, scallop squash, and zucchini
- *C. Maxima*: includes banana, Hubbard, buttercup, large pumpkins, and turban squash

- *C. Moschata*: includes butternut
- *C. Mixta*: includes cushaw squash

So, if your students want to save squash seeds, but avoid creating weird (and possibly tasteless) fruit, they can grow plants of different species near one another (pie pumpkins and butternut, for instance.) If they want to grow squash of the same species (such as acorn and zucchini), they can avoid cross-pollination by separating them by 1/4 mile (unlikely!), or cover the squash with plastic or spun polyester row covers to keep out bees. (To ensure pollination, they'll have to play the bee themselves, as described below.)

### Bee the Breeders

Consider inviting your students to create their own weird squash by encouraging cross-pollination within species. They might, for instance grow acorn squash, zucchini, and yellow crookneck near one another. To make it more exciting, they can "play the bees," by locating female flowers (those with a small fruit at the base) and male flowers (those without the swelling) and using paintbrushes or cotton swabs to transfer pollen from male to female blossoms. Since male flowers typically appear before female buds, you may have to be patient and wait until you have some of each. The article [Breeding Your Own Squash](#) offers detailed advice for hand-pollinating.



### Designer Seeds

Each seed contains very specific genetic material, which causes it to grow into a specific type of plant. Will tomatoes be large or small, yellow or red? For centuries, farmers and gardeners repeatedly saved and replanted seeds from their healthiest plants and most flavorful fruits and vegetables. Early in the last century, scientists extended this strategy by learning how to create hybrids, which reflected valued characteristics of two different parents. In more recent decades, seed companies, a handful of which now control the majority of seeds sold globally, have begun creating **genetically modified plants**. This involves intentionally modifying or inserting genes into new plants, a process that's not possible under natural conditions. This might be done to increase a plant's natural resistance to pests or to boost its nutritional value.

Scientists, academics, and consumers have a range of perspectives on the creation and use of genetically modified plants. Among other factors, supporters point to the potential for reducing pesticide use, boosting nutrition, increasing yields, and creating a more secure food system. Detractors raise concerns about

### Sharing and Swapping Saved Seeds

Invite your savvy seed savers to cultivate new friendships by having fruitful exchanges with other gardeners. Through the interactive [Seed Swap](#) section of our Web site, your students can browse through listings of seeds being offered and post what they have to share.

If they want to find other growing classrooms with which to exchange, try searching in our [School Garden Registry](#) by checking off the box for schools interested in an E-mail Pals Exchange.



NGA's latest book for educators, *Growing Ventures*, features stories of 18 student-run business projects, as well as step-by-step guidelines, activities, and worksheets for engaging students in planning and implementing a plant- or garden-related business that meets your curriculum goals. You'll find more details at our [Gardening with Kids Store](#).

potential negative ecological impacts, health risks, a loss of biodiversity, and increased dependence on large seed companies. Some people simply want genetically modified foods to be labeled so consumers can make their own decisions.

Older students can research the science, history, and debates related to genetically modified organisms. Once they've explored the issues and a variety of opinions, consider staging your own class debate. Since our grocery store shelves for years have contained crops with modified genes — from corn to cotton — you might also challenge the class to figure out how to identify such products, or to learn about the campaigns to label them.

One place to start researching the issues is at the [GMF Questions, Many Positions Web site](#). There, *Science Magazine* asks questions about genetically modified foods (the benefits, risks, and so on) to a number of scientists from around the world representing a range of perspectives on these tough issues. Their responses and other related material is posted.



### Go Seeds Go

As students delve into saving seeds, they will, no doubt, notice some of the mechanisms and strategies plants use to disperse their seeds. (Such mechanisms are often more interesting in wildflowers than in garden plants!) A plant that depends on wind to scatter its seeds may have light fluff (such as milkweed), while a touch-me-not has a mechanism for shooting seeds a distance from the parent plant. Some plants have sweet, fleshy fruits that attract birds to eat them. As the seeds pass through the bird's digestive tract, their seed coats are broken down by acids, and they are excreted to new locations, ready to begin a new cycle.

Consider giving students a chance to develop their own creative strategies for moving seeds. Begin by asking, *Do you think seeds have the ability to move from one place to another? Do you*

*suppose people plant a lawn full of dandelions? What other examples of seeds moving have you observed in nature?* If time and your location allow, take students on a fall "traveling seed" walk. Look at the ground, water, the air, and animals in search of clues that suggest how seeds might travel. (Also have kids examine their socks when they return!) Collect some to bring back to the classroom. Discuss and make a list of adaptations that seem to enable seeds to disperse. Consider the following:

Method of travel	Possible adaptation	Some examples
stick to animal fur	hooks or barbs	burdock
eaten by bird or other animal and excreted	bright color, tasty fruit	cherries, tomatoes
carried by wind	fluff or "parachutes"	dandelions, cattails
floats on water	can float	coconut
flung from parent	spring mechanism	touch-me nots, pansies

After examining various seed dispersal methods and adaptations, challenge teams to invent a creative strategy for dispersing some type of garden seed. (They can use a pea seed as a starting point.) For instance, they might "create" a seed that . . . hitchhikes on a wool sweater or animal for 10 feet . . . is thrown 5 feet from the plant by a special mechanism . . . is carried on the wind for at least 4 feet . . . can float downstream and get washed up on shore . . . attracts and is excreted by a bird. Supply students with a variety of materials for designing their dispersal strategies, such as cotton, feathers, toothpicks, rubber bands, springs, and balloons.

Once teams have tested and modified their designs, have a Go Seeds Go! competition in which teams try to get their seeds into a set location (garden bed, pot, old tire)! Have each group demonstrate its seed dispersal mechanism and tell a short story to highlight the nature of the trip taken by their seed, explaining the natural conditions they simulated.



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