

Growing Together Gardening Club *Resource Packet*



YMCA of Metro North

Lynn YMCA - Melrose Family YMCA - Saugus Family YMCA - Torigian Family YMCA

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Welcome!

The YMCA of Metro North is thrilled to start our first virtual Gardening Club - Growing Together. We are seeking home gardeners in our communities to join us as part of the Growing Together Project. We will be getting our hands dirty at home starting a vegetable garden with your families. We encourage students of all ages, 2 to 102, to join us in learning the science of gardening and sharing nutritional recipes using our harvest.

We will be providing start-up seed kits, gardening basics, helpful tips and tricks, delicious meal ideas, and much more as we collectively build a community of home gardeners. Our resource guide will walk you through planting your seeds or seedlings, transplanting them and a few

articles and resources to help get you started!

Share with us on social media using the hashtags

#GardenTogetherAtHome and
#YMNGrowingTogether so we can follow your progress!



**We are excited to grow
with you!**

Recyclable seed starters:

1. Folded Newspapers



This is one of the eco-friendliest started pots imaginable: newspapers can be found pretty much everywhere, and a few simple folds are all that's needed to create perfect little pockets for nurturing your seeds. Once folded, fill the pots with soil, pop in your seed(s), water, and place in a sunny spot.

2. Cardboard Egg Cartons

One of the most common ways to grow seedlings is to use a cardboard egg container. Just fill each individual egg cup with soil, drop a seed or two into each section, and water. You just have to make sure to keep these well-watered, as the cardboard tends to suck up a great deal of moisture over the course of the day, and dry soil = dried-out seedlings.



3. Egg Shells



After you've cracked an egg or two open for your favorite omelet, don't compost or throw them out immediately! If you've broken them in such a way that the shells are mostly intact (like, if you've just peeled the tops off for a soft-cooked egg breakfast), just wash them gently with soap and water and let them dry. Fill them with soil, pop a couple of seeds into each one, tuck them back into their carton(s), and water them well. You won't have to remove the shells to transplant the seedlings; just crack the bottoms open for the roots to grow out from the bottoms.

4. Jars

Empty baby food jars are ideal for this purpose, but any clean glass jar will do. Once you've used all of the contents, wash the jar thoroughly with dish soap and water, and be sure to rinse it well. Let it dry completely.

Pour a bit of gravel or some small pebbles into the bottom, and then fill with potting soil.



5. Mini Yoghurt Cups



Those individual yoghurt containers aren't just perfect little snacks when you're on the go: they're ideal for growing individual plants that need a bit of extra root-room. Use them to start sunflower seeds and beans, or herbs such as mint, cilantro, or parsley. If you plan to grow plants in them and not transplant them (like in a miniature windowsill herb garden), then poke holes in the bottoms for drainage and add a few pebbles before you pour in the soil.

6. Pastry Containers

You know those plastic take-out containers with the little pop-slots? Pastries such as croissants, danishes, and such usually come in them, and they just end up being disposed of as soon as the last crumbs have been licked from the bottoms. These containers are perfect miniature greenhouses: fill the bottom portion with soil, plant your seeds, and then just pop the top closed in between watering's: it'll create a warm, safe, humid environment for your little seeds to flourish.



7. Paper Cups



Unless you're dragging a reusable cup with you every time you go to a cafe, chances are that each take-out coffee you purchase is served in a paper cup. Larger cups are great for growing herbs on a windowsill, while smaller ones (like espresso cups) are better for things like tomato seedlings that you'll be transplanting once the weather warms up. (These are ideal for kids to plant beans in: they sprout so quickly that the kids remain interested, and they can eat the green beans when they grow!)

8. Cardboard Toilet Paper Rolls

This one might sound a bit weird, but it actually works: take a toilet paper roll and make a few long vertical cuts into one end, then fold them inwards to create a cup. Fill that with soil, add seeds, water, and you'll have plants in no time.



9. Juice Cartons



Slice the spout tops off, fill with soil and a few seeds, add water and sunlight, and poof! Seedlings. This one is best for those that grow quickly, but will need to be transplanted once they're about 6 inches tall, like beans, tomatoes, and peppers.

10. Cans

Strong and sturdy, empty cans are ideal for starting all kinds of seeds. Empty tomato paste cans are great for individual ones, while larger cans like 28oz soup cans are great for mixed lettuces and such. For a little fun, you can use empty bean cans to grow your bean seedlings, tomato cans for tomato plants, etc.



Seed Starting 101:



What you will need:

- Pots
- Soil
- Seeds
- Crafts stick (optional)
- Marker
- Small shovel, or something to scoop with
- Water dispenser (spray bottle, small water can, etc.)

Step 1-

Label your pots with what seed you will be planting in them.

Step 2-

Open the seed packets. If you have different seeds, you can ask your child to compare them!

Step 3-

Place your soil in a large bowl. Add a tablespoon of water into your soil and mix it throughout. Keep adding 1 tablespoon of water into your soil until the soil is moist to the touch and not soaking wet. If it is too wet, your seeds may become rotted.

Step 4-

Scoop soil into pots that you have previously labeled. Fill the pot $\frac{3}{4}$ full with soil. If you are doing this with children, have them count out the scoops with you!





Step 5-

With your pointer finger, make a hole in the middle of the soil about 1 inch deep. Take the seeds that correspond with your labeled pot and put a few in the palm of your hand. Plant a few seeds in each hole, in case one or two don't make it. Then gently push some soil on top of the seeds, tucking them in like a blanket.

Step 6-

Seeds need water to grow. If you have a spray bottle, give them a quick mist over the top. Or, sprinkle a few droplets of water over the top from a watering can or measuring cup.

Step 7-

Place your pot on a windowsill or a shelf that gets sunlight. Seedlings need 6 or more hours of sunlight a day in order to grow.



Continue to monitor your seeds every couple of days. As soil gets dry, give it a little water. Once your plants become 3-4 inches tall you will need to transplant them outdoors. Flip to the "Transplanting" section of this book to learn when and how to do this!

Transplanting your Seedlings:

Hardening Off

Have you heard the advice to "harden off" your seedlings before you transplant them to the outdoor garden and wondered what this meant? Simply put, it means letting plants become accustomed gradually to outdoor conditions of light and temperature before you plant them outside. Plants that your students have grown inside or purchased plants that have been grown in a sheltered greenhouse environment need to be "toughened up" before they're ready to face the rigors of the outside world, with its bright sunlight, cooler temperatures, and drying winds.

Begin hardening off plants 7-10 days before you plan to plant them outside. Start by setting your seedlings out in a sheltered, partly shaded spot for a few hours; then bring them back indoors. Each day, gradually increase the amount of time the plants spend outside and light intensity they receive until they spend the day in full sun and the night outside. Outdoor conditions also increase evaporation and transpiration (the process of plants giving off moisture), so make sure the potting mix doesn't dry out! After a week or so your seedlings will have toughened up enough to withstand the challenges of outdoor conditions. They'll be ready to get established quickly in their new home and put out strong new top and root growth.

Putting Plants in the Ground

Whether you are planting into garden beds, directly into the ground or containers (large pot, bucket, etc.), the technique is basically the same.

- Wait for Cool, Cloudy Weather
If you can, choose a cool, overcast day for planting, ideally with some gentle rain in the forecast. If Mother Nature won't cooperate, try to plant early in the morning before the sun is hot or late in the afternoon. Then rig up some temporary shade structures over plants while they recover from the stress of transplanting.



- Give Plants a Drink in Advance

Make sure your plants were well watered a few hours before you're ready to begin planting (or the night before if you are planting first thing in the morning). You want your plants to be well-hydrated but you don't want the soil dripping wet.

- Have the Planting Hole Ready

Be sure to have the soil in your bed or container ready to receive the new plant, and dig the planting hole before you take the plant out of its pots. This will minimize the time the roots are exposed to drying air. Dig the planting hole as deep as the rootball of the plant so that it will be growing at the same depth in its new location.

- Handle with Care

Remove a young plant from a pot by turning the pot upside down into your hand while holding the stem of the plant between your fingers. The plant's root ball should slip out easily. If it doesn't, tap the edge of the pot against a solid surface as you're holding it upside down; this should dislodge the root ball.

- Plant at the Correct Depth

If the roots of the plant are matted around the outside of the rootball, gently tease them apart with your fingers so they are pointing outwards while keeping the rootball intact. Then place the plant in the planting hole so that the top of the root ball is even with the soil surface. Gently firm the soil around the rootball. If your plant needs support, such as a stake or cage for tomatoes, put it in place now. If your plants have been growing in plantable pots (such as compostable pots), cut away any of the pot material that sticks up above the surface of the soil in the pot before you set the pot in the planting hole so that the surface of the soil in the pot is even with the soil surface in the garden. Any pot material that sticks up above the soil surface will act as a wick, pulling moisture out from around the plant.

- Water After Planting

Water newly set-out plants gently but thoroughly. You don't want to disturb the soil or roots, but you want to make sure that the entire depth of the rootball receives water.



Recipes:



FROZEN WATERMELON POPSICLES'

Okay, these aren't really popsicles. They're watermelon wedges frozen on sticks. But isn't this a nice, cold way to eat your fruit? Leave the rind on, if you want the slices to look classic—or cut it out, if you want to make it easier to put the sticks in.



KITCHEN GEAR

Cutting board
Sharp knife
(adult needed)

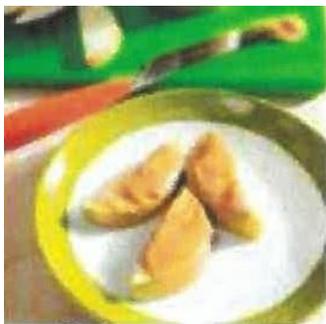
Popsicle sticks
Baking sheet

INSTRUCTIONS

1. Cut across the watermelon to make wedges about 1-inch thick.
2. Carefully cut a slit into the rind of each wedge and put a popsicle stick into each slit.
3. Arrange the wedges on the baking sheet so they're not touching.
4. Freeze until firm, at least 3 hours.

INGREDIENTS

small seedless watermelon



NUTTY APPLE SNACKS

This cute little snack is creamy, crunchy, and satisfying. Plus, it's fun to make with your friends after school!

KITCHEN GEAR

Cutting board
Sharp knife (adult needed)
Dinner knife

INGREDIENTS

1 apple, scrubbed, cored, and sliced
1 tablespoon nut or seed butter



INSTRUCTIONS

Just spread the nut or seed butter on the apple slices!



DOUBLE-MELON SALAD

Feta cheese on fruit? Try it. There's something surprisingly delicious about the combination of salty cheese and sweet, juicy melon.

KITCHEN GEAR

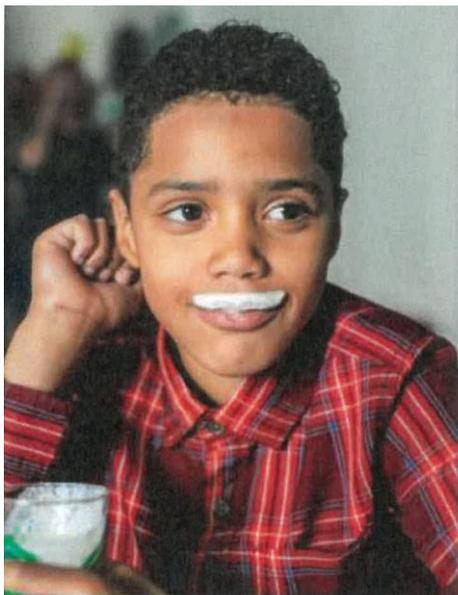
Cutting board
Sharp knife
(adult needed)
Medium-sized
bowl Measuring
cup
Measuring
spoons

INGREDIENTS

2 heaping
cups cubed
watermelon
2 cup cubed or crumbed
feta cheese
2 tablespoon chopped fresh
mint or basil leaves
1 tablespoon fresh lime
1 tablespoon fresh lemon
juice
pinch of
salt

INSTRUCTIONS

1. Put all the ingredients in the bowl and toss gently.
2. Serve right away, or cover and refrigerate up to overnight. (If you want to serve it later, keep the feta out and add it just before serving).



BANANA-ALMOND SMOOTHIE

Why eat your bananas when you can drink them! If your bananas aren't frozen, feel free to add an extra few cube or two.

KITCHEN GEAR

Dinner knife
Cutting board
Measuring cups
Measuring spoons
Blender (adult needed) 2 glasses

INGREDIENTS

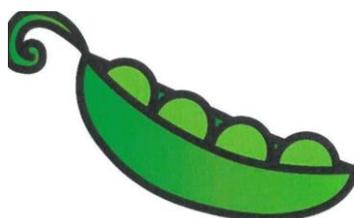
2 overripe banana, peeled and sliced
1 cup plain yogurt
1/2 cup milk or almond milk
1/2 cup almonds
Ice cubes
1/4 teaspoon vanilla extract
pinch of kosher salt

INSTRUCTIONS

1. Put all the ingredients in the blender.
2. Put the top on tightly. Turn on the blender to medium speed and blend until the mixture is smooth, 30-60 seconds.
3. Pour the smoothie into the glasses and serve right away, or cover and refrigerate up to 4 hours.

Fun Facts!

- Tomatoes are both fruits and vegetables. From a botanical perspective, they are fruits because they develop from the ovary at the base of the tomato flower and contain the plant's seeds. But from a culinary standpoint, we usually use them vegetables because they are savory, rather than sweet.
- Bell peppers are nutritional all-stars! A large red bell pepper delivers three times the vitamin C of an orange, along with Vitamin A and the healthful antioxidant lycopene.
- The world's heaviest cucumber, to date, was grown in the U.K in 2015. It weighed a whopping 23 pounds, 7 ounces!
- The world's tallest corn stalk is reported to be 45 feet high.
- Cabbage is a biennial plant, which means it completes its life cycle in two growing seasons. The first season, a biennial grows foliage – in this case, the head of cabbage. If the cabbage isn't harvested, then the following growing season it will form a flower stalk and produce seeds. Then the mother plant dies.
- When you eat broccoli florets, you're actually eating flower buds! If you've ever seen broccoli plants left unharvested in the garden, you know that the buds in a head of broccoli go on to produce small, yellow flowers. You can also eat the stalk, which is composed of stem tissue
- Lettuce was first brought to the New World by Columbus on his second voyage in 1494. **All fun facts were derived from KidsGardening.org*



Website Resources:

Wonderful children's website that includes projects, recipe's and how to's: [https:// kidsgardenin g.org/](https://kidsgardenin.org/)

Benefits of gardening with children:

[https:// www.chil drena ndnature.or g/ 200 9/ 08/ 0 2/ fact sheet summarizes benefits of gar denin g for c hildren/](https://www.chil drena ndnature.or g/ 200 9/ 08/ 0 2/ fact sheet summarizes benefits of gar denin g for c hildren/)

Gardening with seniors:

<https:// www.a gingcare. com/ articles/ gro win g- co nnect io ns- gar denin g- with- seniors- 14 711 1.htm>

USDA Food and Nutrition Resources:

<https:// www.fns.usda.gov/ tn / team-nutrition-garden-resources>



Videos:

SciShow Kids: How does a seed become a plant? (YouTube)

<https:// www.youtube.com/ watch?v=tkFPyue5X3Q>

GPhase: Bean time-lapse

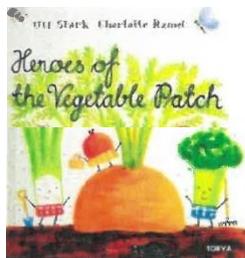
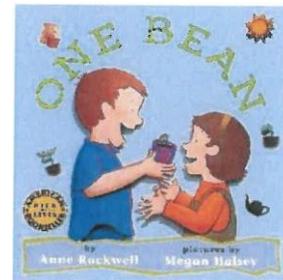
Watch a seed grow roots and sprout over 25 days in this quick time- lapse video! (YouTube)

<https:// www.youtube.com/ watch?v=w77zPAAtV Tul>

Book Recommendations:

One Bean, Anne Rockwell

This book follows a young boy as he plants a bean seed and watches it grow. The simple narrative is easy to play out in real life, which is why this is my go-to whenever I teach younger students (K-2) about seeds and life cycles. Not only does the book provide a model for a seed starting activity, it also includes ideas for additional projects and some in-depth info on beans.

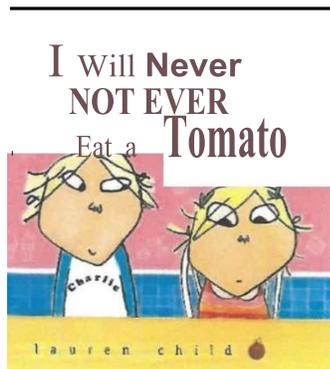
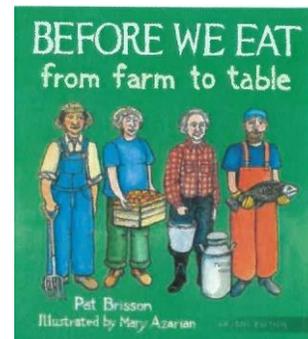


Heroes of the Vegetable Patch, Ulf Stark

This is a fun story about two siblings who care for their neighbor's garden after being magically shrunk to the size of radishes. I really like to read this book at the start of the growing season as a way to get students thinking about their responsibilities to the plants and insects in the garden.

Before We Eat: From Farm to Table, Pat Brisson

The illustrations are absolutely beautiful in this book that asks readers to think about where food is coming from—who grew it or raised it and how it makes its way to our plate. I love using this book to set the stage for cooking activities; it gets students thinking about the story behind each ingredient we're using in a recipe and establishes the concept of gratitude, which we always practice before our first taste.



I Will Never Not Ever Eat a Tomato, Lauren Child

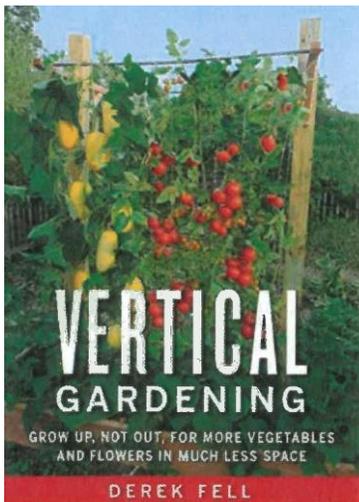
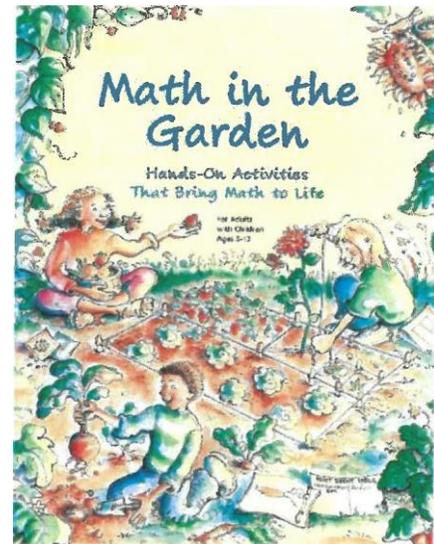
This is another book that I use in conjunction with cooking or tasting activities. In this one, Charlie convinces his very picky-eater-sister Lola to try vegetables by coming up with some creative names for the foods she normally hates. As someone who was basically Lola growing up, I sympathize with a lot of my students who are hesitant to snack on veggies straight out of the garden or partake in the recipes that we prepare in class. I often end up using this book as a starting point for a discussion about how we can build confidence to try new foods.

Book Recommendations Cont'd:

Math in the Garden, Jennifer M. White

This engaging curriculum uses a mathematical lens to take children on an education-filled journey in the garden. Its 36 standards-based activities hone math skills while promoting inquiry, language arts, and nutrition. Through funding from the National Science Foundation, Math in the Garden was developed to support mathematics and science standards and all of the lessons were extensively trial-tested by formal and informal educators and youth leaders nationwide.

- Use a mathematical lens on your next garden journey!
- Includes 36 standards-based activities
- Trial-tested nationwide by formal and informal educators and youth leaders



Vertical Gardening, Derek Fell

If you're pressed for gardening space or simply don't want to care for a huge plot of land, you should read *Vertical Gardening: Grow Up, Not Out, for More Vegetables and Flowers in Much Less Space*. This gardening book delves into vertical growing strategies using string supports, trellises, pergolas, raised beds, skyscraper gardens and more, helping you save space while still cultivating happy plants.

Vertical gardening might sound complicated, but this guide makes it easy for even novice gardeners to understand.

Vertical Gardening focuses on varieties of climbing plants, which are actually less prone to insects, diseases and animal pests, making them easier to care for. The various growing strategies use a mixture of DIY and commercial supports, and there are plenty of tips on how you can reduce work, increase yields and make harvesting easier.

Overall, this book is a hit among reviewers, who say it has great ideas that are very doable. They say *Vertical Gardening* provides excellent alternatives to traditional planting methods, and most are incredibly happy with the results they've seen.

Indoor Seed Starting Q&A

Q: Do you have general suggestions for starting seeds indoors?

A: Each type of seed has slightly different growing requirements, but the basics are the same:

1. Use shallow containers (2 to 3 inches deep) with drainage holes. You can purchase seed starting supplies or use something as simple as an egg carton or yogurt containers with holes punched in the bottoms for drainage. It is easiest to monitor moisture in containers that are no more than a few inches deep – and they require less potting medium!
2. Use a lightweight soilless potting mix. These mixes are made primarily of ground peat moss and have been sterilized, so they are less apt to contain weed seeds, fungi, and bacteria that may hamper growth than garden soil. These mixes also provide good drainage, providing both the aeration and moisture seedlings need. Avoid using garden soil, as it won't provide sufficient aeration and can introduce disease-causing organisms.
3. Moisten the potting mix before placing it in containers. If you can squeeze a handful of the mix and water comes out, it is too wet and you'll need to add more of the dry mix. The ideal moisture level feels like a well-wrung sponge.
4. Fill the containers with moistened potting mix to about $\frac{1}{2}$ to 1 inch below the rim of the container. Rap the container against the countertop to settle the mix.
5. Follow the recommended planting depth on the seed packet when sowing seeds. This is generally 1- $\frac{1}{2}$ to 2 times the width of the seed. However some seeds need light to germinate and must be "surface sown" meaning they should simply be pressed into the surface of the potting mix and not be covered at all; the seed packet will note if this is the case.
6. Water seeds after planting using the mist setting on a spray bottle to avoid dislodging seeds with a strong stream of water. Check daily to make sure the mix stays even moist, but not soggy. Seeds must stay moist in order to germinate properly.
7. If the air in your classroom is very dry, you can maintain adequate moisture for germination by creating a tent over the pots or flats with clear plastic wrap. Prop the plastic wrap off the surface of the planting mix using popsicle sticks or other 'posts' so seedlings don't stick to it. Remove any coverings gradually as germination begins.
8. Most seeds germinate best in warm conditions. Although average room temperature (70°F) is generally adequate for most seed germination, you'll get faster and more consistent germination if you place newly seeded containers in a warm spot (70 to 80 degrees F) or on top of a heat mat (available from garden stores). With the right conditions, most garden seeds should germinate in 7 to 14 days (unless otherwise noted on the seed packet). Once seeds have germinated and produced their first set of true leaves (the very first you see are called seed leaves, and all that grow after that are true leaves), move containers of seedlings off the heat mats.
9. Good light is essential. Once you see the first signs of germination, move the seed trays to a light-filled area. Seedlings need full sun from a south- or west-facing window or, even better, fluorescent lights positioned 2 to 3 inches above the foliage. Use a timer to keep fluorescent lights on for 12 to 16 hours a day. Suspend the light fixtures so that you can move them up as your plants grow, keeping them a consistent height above the tops of the seedlings. Leggy or pale green seedlings are an indication that plants need more light. If your seedlings are growing on a windowsill, rotate containers regularly to keep plants from reaching toward the light source.

10. Keep the soil moist but never wet, as this encourages rot. At first, lightly mist the soil. Once seedlings emerge, place the containers in a tray and water from the bottom to encourage deep root development. Check daily and do not let the soil mix dry out.
11. Wait to fertilize until the seedlings' true leaves (the second set) appear. Then use a weak solution of a high-phosphorus fertilizer (e.g., 5-10-5), which will help the seedlings develop a strong root system.
12. When seedlings have one to three sets of true leaves and are a couple of inches tall, transplant them to a deeper container for growing on until planting time.

Q: What is the ideal temperature for starting seeds indoors?

A: While specific seeds have more precise optimal germination temperatures, in general the following guidelines work fine for many vegetable and flower seeds. For starting seeds, aim for a daytime range of 60 to 80 degrees F and a nighttime temperature that's 10 to 15 degrees cooler. On average, 77 degrees F is optimal, and temperatures should not exceed 95 degrees F or drop below 40 degrees F. If you feel comfortable, chances are your seeds do too. If you are still not certain, always refer to the seed packet for specific information regarding ideal germination temperature. Bottom heat (from a heat mat) will speed the germination of some seeds, especially warmth-lovers like tomatoes, peppers, and eggplants, but are not a requirement.

Q: Is there a systematic way to start seeds indoors with my class?

A: First, mix and moisten enough potting soil for all your containers. If possible, use containers that are all the same size. This will help standardize seeding, watering and transplanting. Fill the containers with exactly the same amount of the soil mixture.

Have just one type of seed per planting station or per session so that different plants do not get combined in any one pot. Once seeds are planted, label them clearly with the name and planting date so you know what went where. You can do this with store-bought labels, popsicle sticks or good-quality masking tape stuck to the outside of the containers. Be sure to write on labels with an indelible marker.

Finally, keep a log of what you did so you can repeat it next time (or not!), and compile a cumulative record of your activities for future reference.

Q: Do you have any helpful hints for very small children planting seeds indoors?

A: Overall, **choose easy-to-grow annuals** that grow quickly and are gratifying—sunflowers, tall zinnias and cosmos are three quick and easy flowers and radishes, lettuce and dill are three super-fast and easy edibles.

- **Give children a sense of plant life cycles** – before planting time. It's nice to show children a mature plant or photos of mature plants before sowing seeds. If possible, also show them a seedpod or seed head from the actual plant you are growing. Providing this link between plant and seed adds to the child's understanding of the planting ritual and the cyclical nature of gardening.
- **Be smart when choosing seed sizes** – Young children have tiny fingers and may have an easier time with smaller seeds than an adult might. A child's 'pinch' of somewhat fine seeds can actually be quite small. Young children delight in carefully counting out two or three seeds and putting

them in each pot or cell. Others might do better with larger seeds, such as bean, melon, squash or marigold. If you have packets of plants with both larger and smaller seeds, try assigning different sized seeds to children based on each child's perceived skill set.

- **Teach potting and spacing technique** - There are several techniques to help children space seeds evenly when planting. For starting seeds in a tray, draw a light line in the potting soil with a pencil or stick and then ask children to space the seeds along that line as far apart as their thumb is wide, or as far apart as a specific spoon is wide. For small pots, instruct children to place one seed at the top, one at the bottom, one on the left, one on the right, and one in the middle for luck.
- **Have fun labeling!** All children love decorating labels for their own pot of seeds, but you can add their (legible) initials, too!

Q: What common things can we use to make our own seed-starting containers?

A: Different plants need different-sized containers, but most do reasonably well in 6-inch pots. You can use smaller pots to germinate seeds, but you'll need to transplant the seedlings later. To keep it simple, use the same 6-inch container for germinating and growing. Here are a few container ideas:

- Milk cartons - Cut quart containers down to make 4-inch by 6-inch containers, or have kids collect pint-size cartons from school. Plastic soda bottles - Two-liter bottles make nice deep containers. Cut off the tops to make 6-inch planting pots.
- Yogurt cups - The six- or eight-ounce cups are ready-made seed-starting pots.
- Egg cartons - Egg cartons work well for starting seeds, but you'll have to transplant them to larger containers as soon as they've sprouted.
- Old shoes, hats, baskets, etc. - You can use anything that can hold soil, as long as it has drainage.

Important: No matter what your homemade container originally was, you must first clean it thoroughly and add a drainage hole in the bottom to avoid waterlogged plants. Drainage holes are usually about the size of a dime.

Q: Since kids can be impatient, what are some fast-germinating vegetable and flower seeds we can grow?

A: Big seeds have the most energy and often germinate the fastest-especially if they are seeds for annuals. Flower seeds that germinate quickly include sunflowers (4 to 5 days), gloriosa daisy (5 to 10 days), ageratum (6 to 10 days), cosmos (4 to 6 days), sweet alyssum (8 to 10 days), zinnia (5 to 7 days) and marigold (5 to 7 days).

Vegetable seeds worth trying include corn (5 to 7 days), cucumber (5 to 7 days), squash (4 to 6 days), tomato (6 to 10 days) and watermelon (5 to 7 days).

To ensure success, plant your seeds in moistened seed-starting mix and place the containers in a warm area, such as on top of the refrigerator.

Q: My children want to try growing plants from seeds they've collected from the wild. What do we need to know to be successful?

A: It's exciting but can also be challenging to grow plants from wild-harvested seeds. Seeds of many plants have adaptations that ensure dormancy until conditions are right for successful germination. This fact can

inspire young gardeners to ask questions and conduct investigations. Here are the basics.

Some seeds require a period of cold temperatures (winter) followed by warmth (spring) to germinate. Others have hard seed coats that soften up during freeze-and-thaw cycles. If you're not planting the seeds right away, dry them in a room with good circulation and then store them in a cool, dry place. Some seeds may germinate without treatment; try soaking some seeds overnight in water and then wrapping them in a wet paper towel and placing the towel in a plastic bag for 5 to 7 days.

To break the dormancy of a seed with a hard coat (such as acorns, honey locust, lupine) you'll need to make an opening in the hard shell that allows air and water to reach the embryo. Use a file or sandpaper to lightly scar the shell before planting it. Boil lupine seeds then let them soak overnight in the water before planting. Seeds collected in the fall may require a chilling period for successful germination. Place the seeds in moist sand in a covered glass jar, or sow them directly in pots filled with a soilless mix and wrapped in plastic. Keep the seeds in the refrigerator for one to four months. Periodically check to make sure they are staying moist.

Sow tree seeds at a depth of three times the diameter of the seed, and wildflower seeds about the same depth as the seed diameter. Press very fine wildflower seeds and grass seeds into the soil and don't cover them.

Remember to provide light, warmth, and moisture while the seeds are germinating. After two to four months of growing indoors (or when spring arrives), you can transplant the seedlings outside.

A word of caution: Never harvest seeds of plants you know to be endangered or in short supply in your area!

Q: Many of the seeds my kids started indoors last year never sprouted, what did we do wrong? We bought commercial potting mix and containers and planted the seeds according to the packet directions. We kept the room between 70 and 75 degrees F and watered faithfully.

A: Please don't give up. Gardening indoors has a few challenges and many rewards. The seeds might have been over watered – drowned seeds are a common occurrence with eager young gardeners. Misting the soil gently provides seeds with enough water to germinate without becoming waterlogged. Seed germination may be another factor. Most seed packets list another piece of information: germination rate. This indicates the percentage of seeds in the packet that are likely to germinate when planted according to directions. Even a packet of the freshest seeds, germination is unlikely to be 100%. Seeds may experience damage from the environment; some may not be mature; others may possess genetic defects that hamper growth. Measuring the germination rates and then translating that into charts or graphs can make an excellent math lesson. It can also spark inquiry.

If you are planting seeds you saved from a previous season, you might want to test their viability before planting. Use the "wet paper towel" test to ensure that the seeds you plant will actually sprout. Take 10 seeds from each type being tested and lay them on moist paper towels (one seed type per towel). Fold up each moistened towel and place it in a labeled plastic bag. After 7 to 10 days unroll the paper towels and count the number of seeds that germinated in each towel. If fewer than five of the 10 seeds in a towel sprouted, buy fresh seeds.

There are also a few other explanations for why your seeds may not have germinated:

- The soil temperature was too cool or too hot. Check the seed packet labels for recommended

temperatures.

- The soil mix dried out. Make sure the soil mix is evenly moist before you plant the seeds, and keep it lightly misted during germination. If you keep the containers covered with plastic or wax paper, the soil mix will stay warm and moist.
- The seeds were planted too deeply. Most seeds should be planted at a depth of three times the diameter of the seed. Sow very fine seeds on top of the soil mix and pat down gently.

Q: Our young gardeners were heartbroken when newly emerged seedlings died. What might have happened?

A: When newly germinated seedlings appear healthy and start to grow, then wilt unexpectedly, the cause is probably a fungal disease called damping off. This fungus attacks the stem near the soil, weakening it and causing it to rot. In addition to killing seedlings, damping off can sometimes prevent seeds from germinating.

Damping off can occur when seed containers are reused without first being sterilized, or when a nonsterile potting medium (such as garden soil) is used. Overwatering and overfertilizing with nitrogen also contribute to the problem, as does poor air circulation.

To prevent damping off, use new soilless potting mix, sterilize containers with a bleach solution (1 part bleach to 9 parts water), keep soil evenly moist but not wet, and wait to apply fertilizer until seedlings have their first set of true leaves. Also, thin seedlings so they aren't crowded in the container.

If damping off occurs, remove infected seedlings and surrounding soil at once. Check the soil moisture and, if needed, allow it to dry out slightly. If seedlings are crowded, thin them to promote air circulation. If you need to replant, sterilize the containers and utensils, and use fresh commercial seed-starting soil.

Q: The kids have had the basic "this is a seedling" lesson since preschool; what else can we teach them?

A: Despite their common characteristics, plants have a seemingly infinite number of variations. Children love to discover 'oddities', so try starting a wide selection of seeds and examining the resulting seedlings.

Begin introducing botanical concepts, such as alternate and opposite leaves, so you can compare and contrast the plants easily. See if the children can predict an unknown plant's ultimate identity and size based on the seedlings' growth at various stages. See if they can match the seed to the fruit or flower from which it came. Look at the seedlings in terms of leaf texture, shade of green, overall form, and growth rate. Can children recognize plants that are related?

Grow a few extra plants. Once established, pull them up and wash off the roots. For example, look at greens, radishes, potatoes, carrots, onions, parsley, and chives. Examine the underground parts of flowers, such as tulips, bearded iris, cannas, marigolds, and daylilies, too. Look for similarities and differences.

Try starting some seeds that germinate over a long period of time, such as tree seeds or perennial seeds, as well as your usual assortment of vegetables and annual flowers. You can also experiment

with pre-germinating seeds and testing the viability of older seeds. Finally, try growing some seeds that need cold stratification in order to germinate. Kids get a kick out of putting seeds in the refrigerator for a few weeks!

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Gardening Basics Series 13



Seeing Green: Photosynthesis 101

Many people feel a sense of calm when surrounded by green plants, whether they're in a woodland, an urban atrium, a greenhouse, or a garden. Ahhh, green: It's associated with life, rebirth, nature, growth, harmony, and freshness. It helps people feel rested and secure. (Recall that people are invited to relax in a "green room" as they wait to go on stage.) It's an all-around friendly color - except, perhaps, in the rare instances when one is "green with envy!"



In the botanical realm, most plants' leaves are green. That's because plants contain a green pigment called chlorophyll. Leaves appear green to us because the chlorophyll *reflects* green wavelengths of light - plants don't have much need for light in the green part of the spectrum. Chlorophyll *absorbs* light in the red and blue parts of the spectrum. Chlorophyll's ability to absorb and use this light is an essential part of photosynthesis.

Using Light to Make Food: The Miracle of Photosynthesis

Photosynthesis is a process during which plants use light energy to manufacture carbohydrates, giving off oxygen in the process. Plants need a source of energy ("food") for metabolism and growth, just like we animals do. Animals get their energy/food by consuming it; plants make their own. (Even carnivores rely on plants; their prey animals are usually herbivores.)

With the abundance of plants around the globe, it's easy to take photosynthesis for granted. But if we think about it, we quickly come to realize that we, and indeed all life on earth, are dependent upon this incredible and vital process!

Photosynthesis can be expressed a chemical reaction that takes place in chlorophyll-containing plant cells in the presence of light:



Reading left to right: Carbon dioxide plus water combine to produce carbohydrates and oxygen. Note that (CH₂O) is in parentheses because doesn't represent a specific carbohydrate but rather the basic ratio of elements; for example, sucrose is C₆H₁₂O₆.

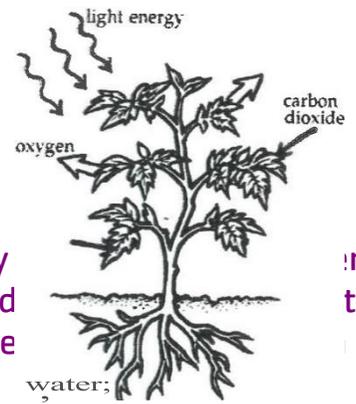
In most plants, air (which contains carbon dioxide) enters the leaf through the stomata - tiny pores located on its underside. Water is absorbed through the

roots and transported to the leaves.

Chlorophyll in the leaf tissue absorbs light energy and uses it to create the end product, carbohydrates, and a "waste product," oxygen. How lucky for us - and for all animals that rely on oxygen to survive!

The equation looks pretty straightforward - maybe you just grab the carbon atom from carbon dioxide and stick it onto the water molecule, right? Actually, it's a very complex phenomenon with multiple, intricate steps.

During photosynthesis, the chlorophyll molecule is essentially and using it to transfer electrons among other molecules. In d light energy into chemical energy (the energy contained in che



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Leaves Aren't Green

Most of the plants we encounter have green leaves, and it's in these green leaves that photosynthesis takes place.

There are a few exceptions.

- Some plants have red, maroon, or foliage in other hues. These also contain chlorophyll, but the green pigment is masked by more dominant pigments, such as carotenoids, (yellow to orange) and anthocyanins (red to purple).
- Plants lacking chlorophyll altogether can't manufacture carbohydrates, so they must get them elsewhere. Indian pipe or ghost plant (*Monotropa uniflora*) is one such example. Common in moist woodlands, its white form resembles a fungus but it's actually a parasitic flowering plant. It takes the nutrients it needs from tree roots using mycorrhizal fungi as intermediaries.
- Plants with variegated leaves - especially those with a large percentage of white in their foliage tend to be less vigorous compared to their all-green counterparts. Less chlorophyll, less photosynthesis, slower growth.
- Palo verde trees, native to desert climates, can photosynthesize through their green bark. This adaptation allows them to produce food even after they drop their leaves to conserve water.

Engaging Reluctant Gardeners

Most children have an innate curiosity and zeal for outdoor activities, but once in a while youngsters are timid about gardening. Some are apprehensive about new situations, such as a garden setting. Others fear stinging insects, suffer from allergies, or simply dislike getting dirty or sweaty.

The first steps are determining why a child is hesitant about gardening and whether you can do something to address the situation. For example, if a child doesn't want to get dirty, provide gloves and make sure the parents know ahead of time when you plan to garden so they can dress the child appropriately. With clothing geared for outdoor fun, gardening activities may be less stressful for the child.

Although you can't control the temperature or the presence of insects, you can overcome these and other potentially off-putting aspects of gardening if children are excited about the activity. Here are 10 ideas for nurturing enthusiastic gardeners:

Instill Ownership

The sense of responsibility and pride that comes with the investment of ownership leads to dedicated, enthusiastic youth gardeners. To achieve maximum buy-in, involve the kids in all steps of the garden: planning, installation, and maintenance. For more tips on how to instill a strong sense of ownership for your garden program, check out [Cultivating Ownership](#).

Provide an Orientation

Most children are more comfortable when they understand expectations and boundaries. Before starting a garden project, do an orientation and explain any rules and procedures clearly. Give a tour of the space, pointing out special features and the location of tools. This helps build confidence and puts children on the track to success.

Choose Engaging Plants

From plants that respond to touch (Mimosa) to plants with animal names (Lamb's



ear), there is a plethora of plants with interesting and surprising features for you to install in your garden.

Recruit Additional Volunteers

Garden activities are best conducted in small groups, where the leader can interact with each child and focus on guiding inquiry rather than delivering instruction. Recruit plenty of volunteers so children can benefit from individual attention. Ultimately, this provides a more meaningful experience.

Link to Loves

Gardens offer a lot of opportunity for creativity in theme, design, and activities. Uncover some of your gardeners' favorite things, such as storybook or television characters, and incorporate them into your garden program. Check out these [theme garden ideas](#).

Plan for Tasty Treats

What could be more fun than enjoying the fruits of your labor? Even if your focus isn't on food gardening, grow a few edible crops, such as cherry tomatoes or sugar snap peas, and make sure each child has an opportunity to sample the harvest. Connecting the garden to the experience of eating helps reluctant gardeners find relevance to their everyday lives.

Attract Animals

Designing a garden to attract birds and butterflies adds another level of excitement. These creatures add a dynamic element because they change and move much faster than plants grow. Check out the following articles for information on attracting flying friends to your garden: [Plant a Butterfly Garden](#) and [Planting for Pollinators](#) .

Decorate with Whimsical Props

Spark your young gardeners' imaginations with fun garden ornaments and hardscape focal points, such as topiaries, fountains, mazes, benches, sundials, gnomes, arches, and gates. Build a [sunflower house](#) or a [pirate's garden](#) .

Reserve Time for Play

All work and no play can turn kids off gardening. Instead, transform learning experiences into games and plan a few contests, such as who can grow the largest pumpkin or tallest sunflower. In the midst of all this fun, students won't even realize they're learning valuable lessons and skills.

Make Something to Take Home or Sell

Creating a garden product to share or sell boosts confidence and is a tremendous incentive to participate in the gardening program. Consider making

flower bouquets, potpourri, sachets, pressed flower cards, or seed packets.

Most importantly remember that each child is unique. Allowing your young gardeners to approach the garden on their own terms is always the best approach. Just like plants, some will grow quickly with great enthusiasm and others may take their time, but with patience and care, they will flourish in the garden.

