

GrowNYC

# Indoor Seed Starting Guide



**GROW**<sup>NYC</sup>



# Introduction

## GROWNYC

We are GrowNYC, New York's leading environmental non-profit. Everyday since 1970, we've been working to make our city healthier, more sustainable, and climate resilient for all New Yorkers and the generations to come. We empower all New Yorkers with equitable access to fresh, locally grown food, neighborhood green spaces, opportunities to reduce waste, and care for the environment. We are committed to providing New Yorkers of all ages and backgrounds with accessible educational tools and opportunities. We are building a more environmentally conscious and climate-resilient city by empowering our citizens to become stewards of their communities.

## GROWNYC SCHOOL GARDENS

GrowNYC School Gardens (formerly Grow to Learn) was established in 2011 with a mission to inspire, promote, and facilitate the creation of sustainable learning gardens at all New York City Public Schools K-12 public and charter schools. Since inception, we have provided materials, mini grant funding, and technical assistance to make our mission a reality.

Gardens range from pots on a windowsill to outdoor raised beds, indoor grow towers, greenhouses, and more. Our goal is to empower school communities, to support them in accessing the resources and dedication needed to launch and sustain learning gardens.

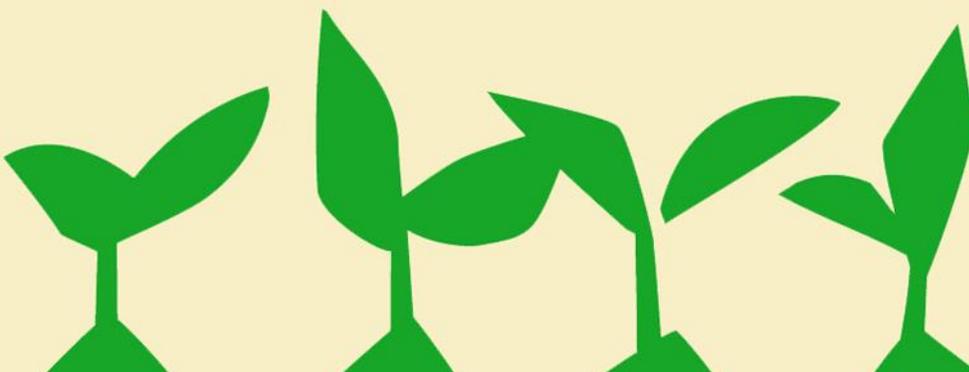
Visit [GrowNYC.org](https://www.grownyc.org) for more information, to get in touch, and to register.

## HOW TO USE THIS HANDBOOK

Use this handbook to learn the process for starting seeds indoors, the necessary supplies, the science of the germination process, how to nurture your sprouts, and tips for transplanting outdoors. It also highlights opportunities for involving students in seed starting activities.

If you have questions or notice information in this guide that should be updated, please email us at [schoolgardens@grownyc.org](mailto:schoolgardens@grownyc.org).

This guide was written and compiled by the GrowNYC School Gardens team in 2025 and will be updated periodically.



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## Table of Contents

<b>Introduction</b>	<b>2</b>
<hr/>	
<b>Vocabulary</b>	<b>4</b>
<hr/>	
<b>What is Seed Starting</b>	<b>5</b>
<hr/>	
<b>Materials</b>	<b>5</b>
Materials List	
Reading a Seed Packet	
Growing Medium	
<hr/>	
<b>Seed Starting Process</b>	<b>7</b>
Planting	
Germination	
Sprout & Seedling Growth	
Photosynthesis	
Thinning	
Troubleshooting Issues with Seedlings	
Hardening	
Transplanting	
<hr/>	
<b>Student Engagement</b>	<b>14</b>
<hr/>	
<b><u>Appendix</u></b>	<b>15</b>
Appendix A: Seed Starting Activity	

## VOCABULARY

Let's begin by defining key terms that will be useful when discussing indoor seed starting.

**Germination:** the process of a seed beginning to sprout.

**Grow Lights:** lights specifically designed to mimic natural sunlight and are used in an indoor setting to help stimulate growth of young seedlings.

**Growing Medium:** a substance through which seeds can germinate and provide a suitable environment for plants to grow.

**Hardening:** the process of acclimating seedlings to the rigors of the outside environment and takes anywhere from 3-4 days to 1 week.

**Photosynthesis:** the process by which plants use sunlight, water, and carbon dioxide to create oxygen and energy in the form of sugar.

**Seed:** part of a plant from which new plants can grow.

**Seedling:** a young plant grown from seed.

**Seed Starting:** the process of sowing seeds indoors weeks before transplanting.

**Thinning:** the process to remove extra seedling sprouts from a growing cell so that only one seedling is left to grow in the space and can maximize nutrient extraction to grow into a healthy, sturdy sprout.

**Transplanting:** <sup>1</sup> planting a seedling and/or a small plant into a larger growing space.  
<sup>2</sup> transferring a seedling from an indoor growing space to the outdoor planting bed.

## What is Seed Starting

Seed starting is the process of sowing seeds indoors during the late winter or early spring, weeks before transplanting outdoors in the warmer spring temperatures. There are many reasons gardeners choose to start seeds indoors. They include:

- **Season Extension**
  - Starting seeds indoors allows one to get a jump on the growing season. This is especially helpful if you live in an area with a fairly short growing season and want to be assured of an earlier harvest. Seed starting is extra helpful for plants that require a longer time to go from seed to harvest.
  - For outdoor school gardens, seed starting allows the opportunity for students to harvest a variety of plants prior to the end of the school year.
- **Educational**
  - You witness the whole process of seed growth to harvest. This is most powerful in a classroom setting where children can witness the entire scientific process of plant growth as a tiny seed transforms into a harvestable and edible vegetable, fruit or herb.
- **Preservation**
  - Starting your own seedlings allows for the exploration of heirloom varieties and seed saving to help increase our biodiversity.
- **Cost Effective**
  - For the cost of one seed packet, you can grow several seedlings rather than purchasing a more costly seedling from a garden supply center.

There are several phases to the overall indoor seed starting process. In order to be successful, each tray or seed pot will need careful management of their environment. The phases of seed starting include material gathering, seed planting, maintenance, germination, and hardening, all culminating in the final phase of transplanting outdoors. Each of these phases is discussed below.

## Materials

Before you begin, make sure everything—including your own hands—are **STERILE** → you do not want to introduce pathogens or bacteria that affect your seeds' growth. The basic list of materials needed for indoor seed starting are:

- Seeds
- Growing medium (e.g., rockwool, coconut coir, seed starting mix, coir sponges)
- Seed starting trays or other small pots and drip trays
- Spray bottle (if the seed trays will be hand watered)
- Labels
- Grow lights and timer or a sunny window
- Space for all your trays and pots
- Heating pad (optional)
- Fan (optional)

**NOTE:** You can also make your own seedling pots; you do not need to use a seed tray. Trays are super helpful if you grow a lot of seeds, but you can also upcycle an empty vessel that might be headed to the recycling bin. Some options are milk cartons, yogurt containers, plastic take-out containers with lids, aluminum cans (be careful of sharp edges), grapefruit rinds, egg cartons, toilet paper tubes. Be creative!

## READING A SEED PACKET

The back of your seed packet has a wealth of information about the tiny seeds that are contained within.

- You will find the Latin and common names for the plant, basic description of the plant and how to plant and harvest it.
- You will also find information about planting seeds: how deep to plant, how far apart, how long until sprouting, and how many days to maturity for.
- You can work backward from the days to maturity to discover when to start your seeds.



Seed Packet Highlighting Planting Directions

A planting calendar can also provide information on when to begin seeds at the onset of the planting season. This is especially helpful if you no longer have a seed packet or have saved seeds from the prior season and need to consult one. The [GrowNYC Spring Planting Calendar](#) provides indoor seed starting and direct sowing dates for commonly grown vegetables and herbs and is based on the last frost dates for New York City.

## GROWING MEDIUM

There are several options for choosing a growing medium for seed starting. We recommend the following options that all have light, well-aerated and loose attributes:

- Seed starting mix: specialized sterile soil for seed starting
- Coconut coir: shredded fiber from coconut shells sold in dehydrated bricks or in dehydrated pellets
- Rockwool: soilless growing medium made from spun basalt rock fibers (for hydroponic seed starting only)
- Your own mixture. Here's a recipe from [epicgardening.com](http://epicgardening.com):

- 1/3-part screened compost
- 1/3-part perlite (naturally occurring, volcanic glass, has high water content and is used for aeration)
- 1/3-part coconut coir

It is essential to start with a fresh and sterile growing medium; do not re-use from previous growing moments. It is not recommended to use outdoor soil for seed starting. This soil will be too dense and not sterile for this process.



*Rehydrated Coco Coir pellets in Seed Start Tray*

## Seed Starting Process

The seed starting process includes the following phases:

1. Planting
2. Germination
3. Sprout & Seedling Growth
4. Hardening
5. Transplanting

Throughout each phase, it will be important to pay close attention to how the seeds grow and adjust environmental factors as they grow to ensure their continued success.

### 1. PLANTING

The basic steps for planting a seed are:

1. Fill the tray cells and/or shallow pot with the planting medium slightly below the top.
2. Dig a little well. The easiest instrument to dig a well is to use your pinky finger as a guide. The well should be no more than half of your pinky nail (about  $\frac{1}{8}$  of an inch).
3. Add 3 to 5 seeds to each well to ensure at least one of them sprouts.
4. Lightly cover the seeds without pressing down on the soil. Remember, the soil needs to be light and aerated.
5. Since the growing medium is already moist, give the newly planted seeds a spritz of water. Keep the soil damp until the seed germinates.

- Cover using a transparent plastic top or wrap. This ensures moisture and warmth while simulating a greenhouse environment. Be sure to remove the cover daily for a few hours or else; it will become too moist for the seeds and rot will occur during germination.

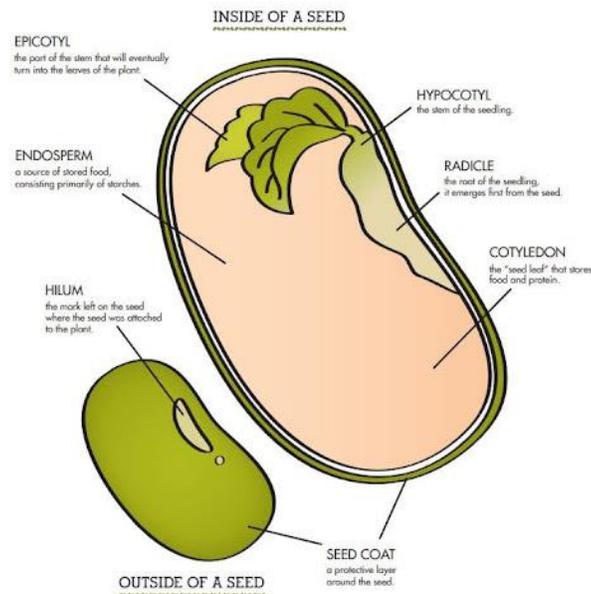
Make sure to label the trays with the date of sowing and plant variety.

- The date will help you track expected germination time frames, so you'll know when to expect little sprouts or detect if something has gone wrong.
- The plant variety is important to note because if multiple varieties are in one seed tray it will be hard to distinguish the baby sprouts once they begin to grow.

## 2. GERMINATION

Before we dive into the process of germination, let us first provide a brief understanding of seed anatomy and explain what is happening on the inside of the seed. During indoor seed starting, a gardener must pay attention to certain external factors to help ensure success with germination and eventual seedling growth.

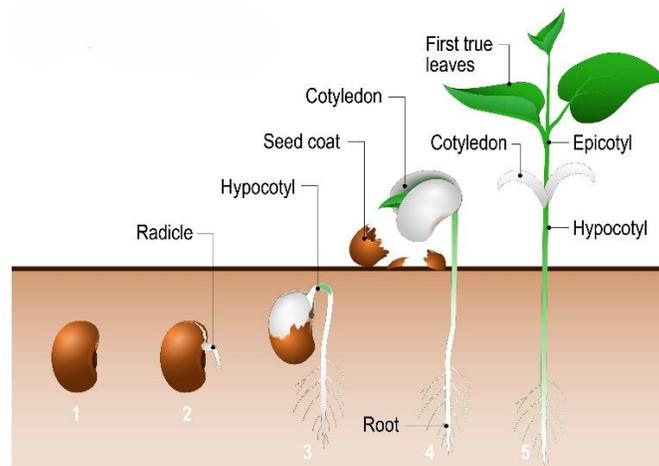
The seed itself is the embryo of the new plant with food to feed itself until it can create its own through photosynthesis. Surrounding this embryo is the seed coat. It is the hard outer coating which offers protection and keeps the embryo moist. The embryo is the growing plant with cotyledons—the first leaves to emerge. The largest part of the seed is the endosperm and makes up most of the seed itself. It is the food for the embryo until it can photosynthesize with its future leaves.



Seed Anatomy Diagram Credit: Education.com

Once the seed is planted and surrounded by soil, the soil provides the seed with heat, moisture, and humidity. All three work together to soften the outer seed coat and allow for those baby roots (or the radicle) to form and push through into the soil. Once the root system reaches a critical mass and can draw water and nutrients through the roots, the embryo will begin to sprout and push upward. The first set of leaves are called cotyledons. They are not the first "true leaves" as these will not undergo

photosynthesis but rather continue to supply nutrients to the sprout. Until the plant has its first “true leaves”, it will live off its endosperm. Photosynthesis will begin once the true leaves have appeared.



*Seed Germination Diagram Credit: Adobe Images*

To ensure success in germination, you can take the extra step to soak your seeds prior to planting. The benefits to seed soaking include:

- Allowing for softening of the hard outer coat
- Jump starting on the initial germination process
- Acting as a test to determine how viable “expired” seeds are.
  - To check viability, soak 10 seeds overnight in a small cup of water or lay them in a wet paper towel for a few days. See how many germinate. If only two germinate, that’s only 20%. Then you know the germination rate has decreased and you should place more seeds in each hole to increase your chances.

The three main factors that can affect germination are:

- **Water**
  - Absorption of water is the first step in germination. Soil should feel like a wrung-out sponge, not soggy. If it’s too wet, the seed might rot and if it’s too dry, the seed will stay dormant.
- **Temperature**
  - Seeds like warmth. Generally, 65-75°F is best for most plants. The back of the seed pack will list the desired temperature range. Be careful placing the seed trays or grow stand near drafty windows or heaters as these can affect soil temperature and the surrounding air temp of the plant.
  - Optional: Place a heating pad/mat under the seed trays to provide extra warmth during germination. Once sprouting occurs, remove the mat.
- **Oxygen**
  - Respiration takes place in all viable seeds; therefore, the soil should be loose and well aerated so the seed can get the oxygen that it needs.

### 3. SPROUT & SEEDLING GROWTH

Once germination has occurred, new baby sprouts will appear on the soil line. At this stage, it's important to pay attention to their water, warmth and light needs.

- **Water**
  - Now that baby leaves are starting to grow, reduce the water (slightly) so as to not overwhelm them. Soil should feel like a wrung-out sponge. It's best to water with a spray bottle to moisten the soil rather than risk drenching it using a watering can. If you use a self-watering system, continue with that.
  - If a clear plastic lid was used during the germination phase, remove the lid once sprouts appear. This will avoid the lid from trapping too much moisture for your sprouts.
- **Warmth**
  - Seeds like warmth. Remember to keep the temperature in the 65-75°F range.
- **Light**
  - Light is essential for sprouts to grow strong and begin the process of photosynthesis. If you have one, place them near a sunny window to soak up the sun. If you do not have access to a sunny window, the next best option is to supplement with grow lights.



### PHOTOSYNTHESIS

Plants need light for photosynthesis to occur and without it, they can't make the "food" they need to grow and survive. Vegetable plants especially need more hours of light than non-food plants. Typically, indoor light levels are lower than outdoors. Sunny windows are an option, but for maximum success grow lights can help.

Here are three elements to look for when choosing a grow light:

- **Light bulb type:** use either a T5 tube-shaped fluorescent light bulb or T5 LED light bulb. Fluorescent light bulbs may offer a more financially practical option, but LED light bulbs will last longer. Both offer the same favorable light solutions for the seedlings. The T5 label means its tube shaped, and the 5 means it's about ½ inch in diameter. T5 tends to be the most efficient with respect to light output and energy use.
- **Color Spectrum:** Plants respond to different parts of the light spectrum in different ways. Full spectrum is just fine for general growth. Blue spectrum is best for promoting vegetable growth while red spectrum is best for flower promotion. The color temperature of light is measured in Kelvins. T5 is a 6500K full spectrum light and mimics the light spectrum plants experience in an outdoor setting.
- **Timer:** Utilizing a timer will make it simpler to control the hours the seed sprouts receive daily; 14-16 hours a day is optimal. A timer also helps to relieve pressure of always needing to be there to turn the lights on and off at obscure hours of the day. If your grow light does not come with a timer, plan to purchase one separately.

Overall, remember that it's important to hang the lights in such a way that the light is a few inches from the top of the seedlings (once leaves are here). Then, raise the light as the plants grow. Lights

hung too low will scald the leaves, and lights hung too high will not give enough light. It is a balance that requires much tweaking. For more information on grow lights, see the Additional Resources box at the end of this section.



*Seed Tray under a Tabletop Grow Light*

#### ADDITIONAL RESOURCE

- [KidsGardening: Getting Ready to Grow Under Lights](#)

#### THINNING

Hopefully, germination was 100% successful and all the seeds germinated, which means more than one plant per cell is growing. On the one hand, this is an enviable predicament to be in, but unfortunately, not all of these new seedlings can be kept. There will not be enough space in the cell for one to grow into a hearty, healthy seedling that can survive outdoors. Thinning is the process of removing extra seedling sprouts from a cell tray so that only one seedling is left to grow in the space.

Wait until all the seedlings have multiple sets of true leaves and choose the most robust one to keep.

- Simply cut the extra seedlings off with clean sterile scissors, being careful not to damage the remaining seedlings.
- Do not pull the seedlings out, as this can disturb the roots of the remaining seedlings.



*Examples of multiple seedlings sprouting in one soil cell*

## TROUBLESHOOTING ISSUES WITH SEEDLINGS

Despite best efforts to give the seedlings adequate light, moisture and warmth, sometimes they just do not grow as well as we want them to indoors. The baby sprouts and seedlings will quickly show if they are struggling. A healthy seedling has a bright green color to the leaves, a few sets of leaves and a nice, thick, short stem. If the seedlings look stringy and the leaves are quite yellow, the plant is “etiolated” which means it is growing and reaching for the light, so it becomes leggy.

### Solutions include:

- Moving the pot closer to the sunny window, or if you are using grow lights, move the light down to just a few inches from the leaves to see if that corrects the reaching for the light.
  - Monitor the water level in case there might be some overwatering going on.
- Think of the factors that help germination (water, warmth, and oxygen). Adjust each as you determine which is the issue.
- If nothing grows, perhaps the seeds are too old or maybe they were buried too deep. Try planting again.



*Left: Healthy green seedlings*



*Right: Long and leggy seedlings*

## 4. HARDENING

Hardening is an especially important step to ensure success when the seedlings are ready for transplanting. Hardening is the process of acclimating your seedlings to the rigors of the outside environment and takes anywhere from 3-4 days to 1 week. This is not a firm timeline for the hardening phase, and you should adjust as necessary as you observe how your seedlings are doing.

**The process:** Pet your plants! Gently stroke them as this simulates wind and encourages plants to build stronger cell walls. You can also turn a gentle fan on the plants for a couple hours a day. Make sure the fan does not dry out the soil.

- Take them out for “recess”. On mild weather days, leave seedlings outdoors or at an open window for a few hours a day to acclimate (start with days above 45°F, not too windy and not too sunny).

- Reduce water just a tad to mimic outdoor conditions, as they may not get perfect amounts of water each day once outside.

If you are working with students, hardening is a great activity to include them in. They can help with moving seed trays inside and out, tracking the time, and observing and recording how each seedling is doing with the process.

## 5. TRANSPLANTING

The last phase of the entire seed starting process is transplanting the healthy seedlings once they have been hardened off. There are five elements to focus on when transplanting:

- Timing – transplant in ground and/or planter bed when seedlings have about 3 sets of leaves and after the last anticipated frost date for your region. Cloudy days are best. Hot and sunny days will overstress your plants. Do not plant after a big rainstorm when the soil may be water-logged.
- Watering – water the soil in the garden bed and/or planter first if it is dry. Moisten it, but do not flood it.
- Make space – dig a hole the same size, depth, and diameter as the root ball of your little plant.
- Removal from the growing cell/tray/pot – the seedlings are still delicate so when removing from the growing cell, be extra careful.
  - *Gently & delicately pinch* them out of the pot (squeeze the roots so the plant pops up a bit).
  - *Do not pull from the stem.* These are still very much babies and that will break them. You can loosen the roots ever so delicately as well if they are especially root bound.
  - *Pay attention to how the roots are growing.* If the roots are white and not tangled, the seedling can be planted directly. If the roots are “root bound” which means they are still healthy and white in color, but are tangled together, the roots will need to be loosened gently with your fingertips to spread apart when planted. Do not break the roots; they are fragile. By spreading them out, the roots will know they have more space to grow in their new home and will not continue to be root bound.
  - *Plant at the same depth* the seedling was growing in the pot or tray, not deeper or shallower. Firm the soil and water gently and thoroughly.
- Watch for “Transplant Shock”– your plants have been used to near-perfect growing conditions on the inside, so moving outside full term might give them a shock. It is possible they will look ragged for a couple of days while they settle in but should perk up in a few. If they do not at all, which is possible, begin again with seed starting or direct sowing outdoors.



When planting in a garden bed, pay attention to the directions on the seed packet for how far apart your plants should be and plant accordingly. This will give the seedlings room to grow to their full potential. Here, we have a raised bed at GrowNYC Teaching Garden on Governors Island to illustrate how a bed can look with seedlings spaced apart in their planting.



*Seedling Spacing & Student Transplanting at the Teaching Garden*

## Student Involvement

Indoor seed starting is an excellent activity to involve students in. It's a great experience for them to see the whole process of starting from seed through growth to harvest and finally, to their plates! To get students interested, give them tasks throughout the planting process.

Activity options include:

- Decorating upcycled pots
- Germinating seeds
- Filling seed trays with soil
- Poking holes for seeds.
- Adding seeds to soil
- Creating labels
- Conducting daily watering checks and weekly nutrient checks
- Checking the seedlings for any growth or pest-related issues
- Transplanting into larger pots or outside into a garden planter
- Harvesting and making a feast out of what they grew

*Seed Starting at PS31K*



## ADDITIONAL RESOURCES

- [New York Agriculture in the Classroom Lesson: Farming in a Glove \(Gr. K-2\)](#)
- [New York Agriculture in the Classroom Lesson: Farming in a Glove \(Gr. 3-5\)](#)
- [New York Agriculture in the Classroom Lesson: My Little Seed House & Seed Book \(Gr. K-2\)](#)
- [New York Agriculture in the Classroom Lesson: Supreme Seeds \(Gr. K-2\)](#)
- [New York Agriculture in the Classroom Lesson: Seeds, Miraculous Seeds \(Gr. 3-5\)](#)
- [New York Botanical Garden School Gardening 101 Session 3: Seed Starting](#)
- [New York Botanical Garden School Gardening 101 Session 4: Seedling Management](#)

## Appendix

### [Appendix A: Seed Starting Activity](#)

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## **Appendix A: Seed Starting Activity**

### **OVERVIEW**

In this activity students will investigate what seeds and plants need for plant growth by examining and planting seeds in an indoor setting. Students will discuss the difference for sowing seeds outdoors versus seed starting indoors. Students will also experience planting seeds for indoor growth.

### **TIME**

40 minutes

### **GRADE LEVEL**

Elementary (K-5)

### **VOCABULARY**

Seeds, Seed Starting, Germination, Growing Medium, Grow Lights

### **MATERIALS**

- Seeds
- Growing medium (e.g. rockwool, coconut coir, seed starting mix, coir sponges)
- Seed trays or other small pots & drip trays
- Spray bottle (if the seed trays will be hand watered)
- Labels
- Grow Lights & timers or a Sunny Window

### **ACTIVITY TASKS**

#### **Warm-up (5 minutes):**

Lead a class share-out of what plants children are most excited to eat that has grown from a seed.

#### **Activity 1: What Do Seeds Need to Grow? (10 minutes)**

- Have the students brainstorm what seeds need to grow outdoors.
  - Answers to look for: sunlight, water, soil, air
- Now contrast that with what the requirements are to grow seeds indoors.
  - E.g., How do we mimic the sunlight for our seeds growing inside?
    - This is a moment to introduce the purpose of grow lights.
- Question to pose: What are some reasons that we want to start our seeds indoors and not wait for the outside temperature to be warm enough to plant the seed in soil?
  - Answers to look for:
    - To get a head start on the growing season so that when it's warm, we have baby seedlings to plant and not just seeds.
    - To have an earlier harvest – eat our veggies faster!
    - Science – it's interesting to see a seed sprout in front of your eyes and grow big.

### **Activity 2: Label Making (5 minutes)**

*Note: In preparation for label making, it is helpful to have the blank labels in a bowl in the center of the shared tables as well as a separate cup with the writing utensils.*

- Have the students write out the name of the plant/seed they will be planting today and place nearby to be used at end of seed sowing.

### **Activity 3: Seed Planting (15 minutes)**

*Note: In advance of this activity, supplies for each student can be placed at the center of each of the shared tables, or students from each group can be called up to the front table to gather enough supplies for each group of students.*

Each student will need:

- 3-5 seeds
- Either an individual growing cup or the tables can share a tray and all work together
- Growing medium (slightly damp when you squeeze into a ball, it should hold its shape and not dripping wet)
- Spray bottle
- Label

*Instructions:*

1. Fill the tray cells or other vessel for holding the seed with the planting medium slightly below the top. If the growing medium isn't already damp, have the students spray the soil so that it becomes damp rather than soaking wet.
2. Dig a little well. The easiest instrument to dig a well is to use your pinky finger as a guide. The well should be no more than half of your pinky nail (about ,1/4 of an inch).
3. Add 3 to 5 seeds to each well to ensure at least one of them sprouts.
4. Lightly cover the seeds without pressing down on the soil.
5. Have the students give the newly planted seeds a spritz of water.
6. Cover the tray using a transparent plastic top or wrap. This ensures moisture and warmth to help in the germination process.
7. Choose a student representative to move the seed trays to the grow light stand or to a windowsill.
8. Clean up. Students work together to clean up the supplies as directed by the teacher.

### **Activity Wrap-Up (5 minutes)**

Share with the students that today's activity is just the first step in caring for the seeds. At the next class meeting, students will receive instructions on how they will further care for the seeds and seedlings as they grow.

*This lesson is adapted from the GrowNYC Teaching Garden's Seed Lesson.*