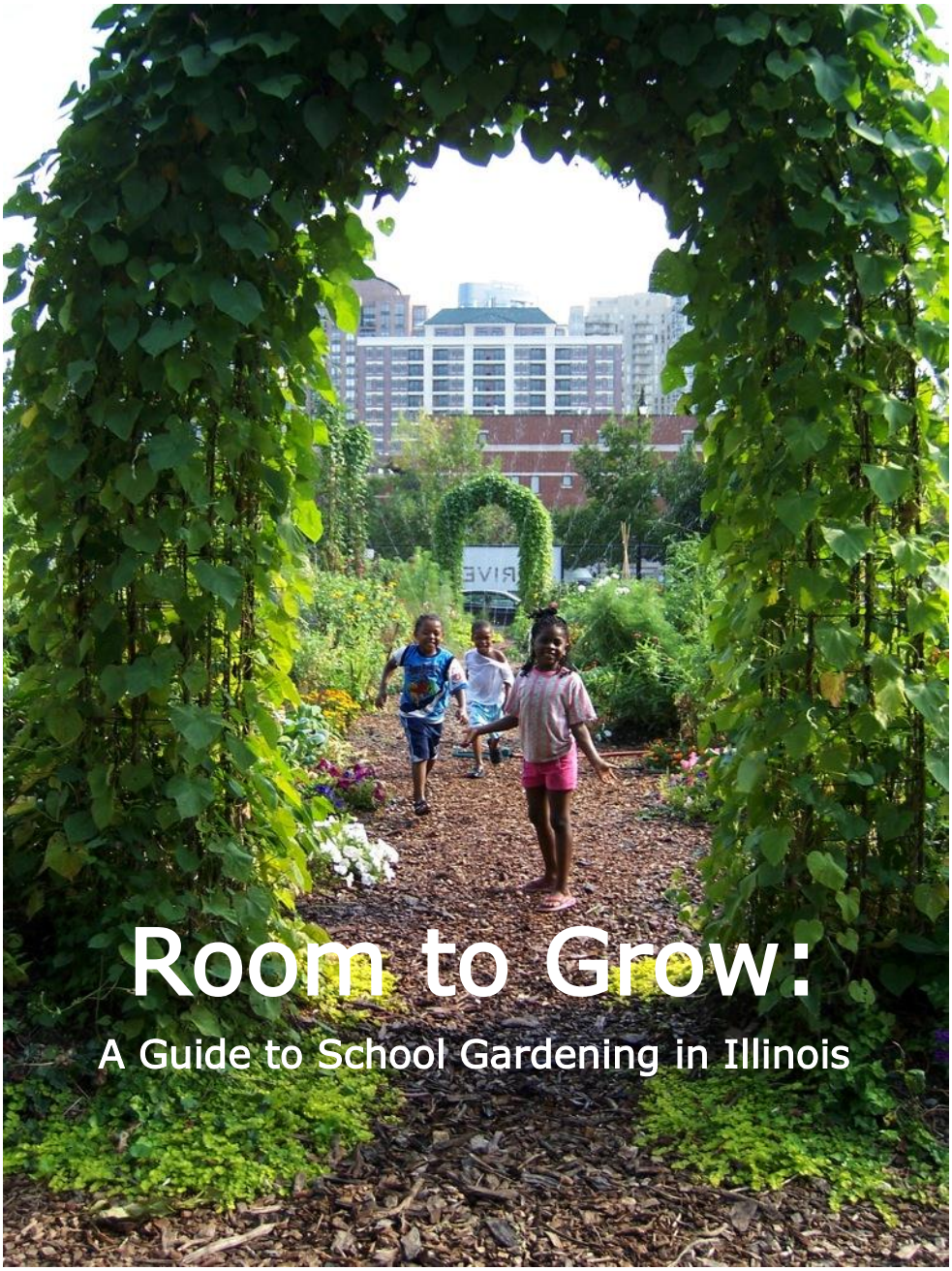

Room to Grow:

A Guide to School Gardening in Illinois

GROWING POWER INC.

Produced for:

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About Us

Growing Power transforms communities by supporting people from diverse backgrounds and the environments in which they live through the development of Community Food Systems. These systems provide high-quality, safe, healthy, affordable food for all residents in the community. Growing Power develops Community Food Centers, as a key component of Community Food Systems, through training, active demonstration, outreach, and technical assistance. To learn more, please visit our website: **www.growingpower.org.**

Market Basket Program:
In Chicago, we have 14 active market basket sites, including our own at Iron Street Farm. At these sites, neighbors can pick up affordable fresh produce and share in our farmers' bounty. Different from a Community Supported Agriculture (CSA) Program, our Market Basket offers a variety of produce, from local farmers and from small-scale wholesalers to create a one-stop produce pick-up. To set up a market basket pick-up site near you, contact *info@growingpower.org*.

Farmers Markets:
From May through December, you can get your fresh produce at one of our local markets in Chicago. The following is a list of markets where you can get your delicious greens and hardy vegetables:

- 61st Street Farmers' Market in Woodlawn on Saturdays
- Chicago Lights Urban Farm in River North on Saturdays
- Green City Market in Lincoln Park on Wednesdays and Saturdays
- Iron Street Urban Farm in Bridgeport on Saturdays
- Altgeld Market at 132nd and Ellis on Thursdays

Youth Program:
Teens work after school and during the summer at all of our urban farm sites in Chicago. In 2010, through our partnerships with After School Matters and the Chicago Housing Authority, Growing Power Chicago awarded stipends to 210 teens that got their hands dirty working at active, thriving neighborhood farms. Our diverse activities integrate hands-on urban agriculture work with curriculum on local food systems, beekeeping, composting, and food justice to name a few. Growing Power's Youth Corps program seeks to give youth tangible job training and skills that will encourage them to pursue jobs within the local food system.

School Garden Support:
In Winter 2012, Growing Power will be launching its support for school gardens through workshops and technical support that will help educators design, plan, and maintain school gardens. Growing Power seeks to make school gardening an approachable and sustainable practice so that gardens can become an indispensable and holistic source of learning for youth.

Growing Power also conducts tours for schools and opens up our space for garden education. Tours take place Tuesdays and Thursdays at 1 pm and Saturdays at 10 am and 1 pm. There is a $10 suggested minimum donation. For more information about tours, please contact Erica Hougland at (773) 376 - 8882 or *erica.hougland@growingpower.org*.

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School Garden Basics

Establishing a Successful School Garden

School gardens create a wonderful outdoor lab for students to engage in hands-on, inter-disciplinary learning. At their best, school gardens allow students to learn core concepts while gaining both physical education and learn that their food really comes from the ground, not the grocery store.

School gardens take an incredible amount of work and attention to create their desired outcomes. Before Growing Power will install a school garden, many factors must be in place. Below is a list of questions that should be considered before a school garden is created.

Who is interested in creating a garden?

- Do teachers and parents know about the plan and approve of the garden?
- If so, do teachers plan on using the garden as part of their curriculum?
- Does the administration support the garden project?
- Will community members be involved in the garden?
- How will students be engaged in the garden?

> *Develop a mission first to help identify what it is you want to do with the garden so you can decide what to plant. Is it for the food bank, the school -- do you want a variety of crops or just one crop? Focus on what you're going to do with it in the end.*
>
> *--Cathi Knickrehm*
> *Hatch Elementary School, Oak Park, IL*

Who will maintain the garden?

- Is there a volunteer coordinator?
- Who are the teachers and parents interested in maintaining the garden?
- What kind of time commitment can they offer?
- Is the time commitment seasonal?
- Who will maintain the garden during the summer months when school is out?
- Who is available to install the garden?
- Who will clean up the garden at the end of the season?

Where is the garden located?

- Is there a water source? Is there a water hose?
- Will volunteers have tools or will the school fundraise for tools?
- Is the location secure? Does the garden need a fence?
- What are the garden's dimensions? Is the size appropriate for those maintaining the garden?
- Are there challenges to growing in the space – is the location sunny, shady, on a slant?
- What crops will be grown given the challenges in the garden?

School Garden Basics

Garden Checklist	Elements to Consider:	Notes:
Sites and Potential Spaces	• 1 city block = 5 acres • 1 acre = 48,000 square feet • 1 city lot = average 40' x 120' • Multiple sites • Park land/unused paved space • Community Garden space • School garden • Rooftop • Container	
Plants	• Vegetables and edibles (annual and perennials crops) • Fruit Trees • Fruiting vines and berries • Nut Trees • Trees, shrubs, ornamentals • Bulbs • Native Plants	
Soil	• Soil testing and remediation • Fertility inputs and amendments • Raised beds • Containers	
Water	• Irrigation system • Rain barrels • Fire hydrants	
Labor	• Volunteers • Seasonal labor • Youth involvement	
Liability and Policy	• Insurance coverage • Zoning for the area • Farm stand sales/tax or no tax? • Security and site access	
Livestock	• Worms • Bees • Rabbits • Fish (Aquaponics)	
Structure	• Storage Shed • Market Stall • Hoop Greenhouse • Tools • To fence or not to fence	
Community Food Security	• Responsibility and relationships to local residents	

School Layout Guide

1. What's on your site?
Quickly draw shapes of trees, garden boxes, walkways, etc. in your space. Sketch simple circles for trees and other shapes!

2. Make a light chart:
Notice shade, partial light or full sun in your garden space. Track the light in the morning, mid day and early evening. This will change with the summer light and with greenery returning. (You will use this information when selecting crops according to their light needs).

3. Identify water source:
Think about drip irrigation or sprinkler system for your garden. Sometimes the nearest water source is a fire hydrant.

4. Examine the soil quality, texture:
Is it rocky? Sandy? Clay?

5. Compost pile:
Designate an area in the garden that will have enough space, and that is close enough to a water source, for a compost pile.

6. Measure the space you will be devoting to this year's growing season.

7. Begin thinking about what you would like to grow and how it will be used. Be creative. Think about flower, herbs, planting a fruit tree, nut tree or vines!

8. Plan for early crops, carrots, radishes, beets, spring onions, lettuces, cabbages, greens. Then tomatoes, peppers, squash, potatoes, pumpkins, gourds, herbs. In the Fall with more greens, lettuce, beets, etc.

School Garden Basics

Tips for Gardening with Children

- Have the children name the garden and create the sign for the garden. This gives your youth instant ownership of the space.

- Engage children in the garden design. Have a contest, conduct a survey of each class, or have the kids write down their favorite vegetable. Leave behind notions of a garden with perfect rows and create something engaging, magical, and maybe even a little wild. Create a circle, spiral, rainbow, salsa, cracker-jack, pizza, or salad garden.

> ***We've had success with kids' involvement in [the garden] partly because it's positioned in the playground area. Kids are constantly surrounded by it and engaging in it.***
>
> *-- Dan Schnitzer*
> *Academy for Global Citizenship, Chicago, IL*

- Your goals should dictate your theme. If you want to grow food for the cafeteria, a traditional garden with intensive production will be needed.

- Start small! That way the garden won't overwhelm you.

- Keep chore sessions short. Make weeding a game and keep it limited to about 10 minutes.

- Help children be successful by doing your homework. Choose a good spot, have your volunteers in order, and know whom to contact when you need help. The kids will have more fun if the site is well maintained and lush.

- Let the kids be the leaders. You may want to pull weeds, but maybe they want to check out the awesome bug on the weeds. Take the time to check out the little things and look for the teachable moment.

- Fun and creative activities work best in the garden – art, journaling, crafts, creating stories, measuring sunflowers, etc. Remember to have fun while you're learning.

- Use kid-sized tools for planting and digging.

- Keep safety in mind – consider soil contaminants and poisonous plants before you start your garden.

Recruiting Volunteers for a School Garden

Step One: Creating a Garden Committee

Begin by starting a Garden Committee that consists of both teachers and parents. Ideally, this committee becomes institutionalized within the Parent-Teacher Association so that the committee commitment is renewed annually, giving new parents and teachers the ability to have input in the garden. The committee should:

- Identify a volunteer coordinator
- Fundraise for the garden
- Set goals for the growing season
- Create the garden's calendar of events
- Design the layout of crops for the garden
- Recruit volunteers to maintain the garden
- Recruit a Master Gardener through your local extension to provide technical expertise

Step Two: Recruiting Volunteers

Volunteers are crucial to making a school garden successful. A mixture of parents, students, and teachers is the ideal volunteer combination. When recruiting volunteers, remember to make the commitment manageable – demanding too much will scare off volunteers. The following are a few suggestions for creating a volunteer program:

> ***It's really great to connect with organizations like master gardeners -- connecting with them and creating a relationship is key. Developing a relationship with a Master Gardener so that they are committed to your garden is really important.***
>
> *-- Dan Schnitzer*
> *Academy for Global Citizenship, Chicago, IL*

The Buddy System

1. At the beginning of the season, have training events to show volunteers what is planted in the garden, how to water correctly, what a weed looks like, etc. Let the volunteers take part in the spring planting which will help establish a sense of ownership in the garden.
2. Ask volunteers to make a one-hour, weekly commitment to the project to be renewed in the spring (April 15–June 15), summer (June 16–August 15), and fall (August 16–October 15). Splitting up the time period helps everyone to check-in and evaluate how the relationship is working.
3. When creating the schedule, insist that folks work in pairs. The buddy system helps give accountability to the weekly commitment. This also means that individuals will help recruit their friends to help them in the garden. It is an easy sell when friends get time to hang out and help out their community.

4. Have the pair decide who will be responsible for watering and weeding. Both tasks must get completed during the allotted time.
5. At a minimum, eight people will need to be recruited – four pairs to water and weed four days a week. The ideal number is 14 – two people spending at least one hour in the garden every day of the week.

Co-coordinators:

1. Recruit two individuals to co-coordinate the garden's maintenance. One coordinator would recruit and schedule volunteers for weeding and the other for watering.

2. The individuals would be responsible for making sure the work gets done and would schedule what areas of the garden are most in need of attention.

Step Three: A Succession Plan

The major reason why a garden committee is essential to volunteer recruitment is to help ease the succession of a volunteer coordinator. It is important that the maintenance of the garden doesn't wane from year-to-year in order to keep support for the garden high, especially from the school administration. If the volunteer coordinator is leaving the school the following year, the garden committee can help recruit a new coordinator and help make this transition seamless.

School Garden Curriculum

At Growing Power, our expertise is growing healthy food to encourage healthy communities. As part of our School Garden Support, we are working to help aggregate and disseminate curriculum that teaches youth about the importance of gardening and connects the garden to their everyday learning experiences. Throughout this guide, we provide a few sample lessons that we use with our Youth Corps program and our school garden work. In the coming years, we hope that teachers will use Growing Power as a resource and space for developing new curriculum and help us fill in the matrix below to compile a dynamic set of plant-based lessons.

School Garden Curriculum Guide*

	Early Elementary	Late Elementary	Middle School	Early High School	Late High School
Science		12.B.2a Garden Planning (p. 18) 12.B.2b Seasonality (p. 19)	11.A.3 Worm Senses (p. 31) 12.A.3 Seed Starting (p. 21) 12.B.3a Garden Planning (p. 18) 13.B.3d What is the Food System? (p. 34)		12.B.5b Grow, Garden, Grow! (p. 38)
Social Studies		17.A.2b Garden Taste Test (p. 39)	15.A What is a Food System? (p. 34)	15.E4b What is a Food System? (p. 34)	15.D.5a What is a Food System? (p. 34)
Language Arts	CC.K.W.2 Seeds We Eat (p. 23)	CC.5.W What is a Food System? (p. 34)			
Art	26.B.1d Building Worm Bins (p. 29)	26.B.2d Building Worm Bins (p. 17)	26.B.3d Mushroom Jars (p. 33)		
Math			CCSS 6.RP Compost Ratios (p. 26) CCSS 8.EE Garden Graphing (p. 44)	CCSS G-MG Grow, Garden, Grow! (p. 38)	CCSS - Modeling Cultivating Food Security (p. 41)

*Curriculum is arranged according to Illinois state standards and the new Common Core State Standards (CCSS) for Mathematics and Language Arts

Designing and Planning Your Garden

Tips for Designing a School Garden*

Ownership: Design a garden where children can be free to touch, smell, and play. Let the kids have a say in what is planted.

Garden Sign: The garden should start with a sign developed by the children. Have a contest to name the garden and design the sign layout.

Scale: Depending on your goals for the garden, the scale for the garden will vary. If the garden is for food to be used in the cafeteria, you will need a traditional garden that is production oriented. If the garden is for education and food tasting, create a more intimate space.

Culturally Appropriate: Grow crops that children know and like to eat. Consider what children eat at home and try to reflect that in your garden space. Ask students what their favorite foods are and break that down into plants that they can grow.

Developmental Level: Consider the age of the children and their developmental level when designing the garden.

- **Aesthetics:** Children are drawn to attractive spaces. Incorporate fun into the garden and keep it looking well maintained.
- **Color:** Create a garden with lots of bright color. Look through seed catalogs to find crops in funky colors – pick an orange and purple carrot for drama.
- **Landscape Elements:** Add a squash tee-pee for height, a bean tunnel, or water elements. All elements should encourage participation and activity.
- **Water:** Pick a site that is near a water source. Make it easy for your volunteers to do their maintenance job.
- **To Fence or Not to Fence:** You want to encourage folks to come into the garden, but you also want to keep it free from flying balls and vandals. Creating a fence that is ascetically pleasing, perhaps a living fence, can be inviting while protecting the crops within the garden.

*This list is based in part on Catherine Eberbach's research with how children interact in ornamental gardens.

Designing and Planning Your Garden

Building Healthy Soil
Organic gardeners work with nature to create an ideal environment for both the plants and the people who tend to them. Building healthy soil is at the heart of organic gardening methods. In natural ecosystems, soil fertility is constantly replenished by the breakdown of plant materials and the work of worms and microorganisms; there is no need for synthetic fertilizers. A garden is a human-created ecosystem, and an organic gardener replicates the natural process of soil fertility by adding compost to feed the soil-building organisms.

Just as a healthy person is less susceptible to catching a cold, so are healthy plants less susceptible to insects and disease. Plants grown in healthy soil, high in organic matter and rich with worms and microorganisms, provide a stable supply of nutrients and moisture necessary to minimize stress. The organic matter in the soil acts as a sponge, holding water for future use. Soil low in organic matter does not do this.

Bed Preparation
Growing Power's technique for building beds is a quick and accessible way to create garden space nearly anywhere. Using wood chips, we create a foundational two-foot layer and then create our beds using fresh compost directly on top of the wood chips. This method can help keep construction costs extremely low and also make gardening very accessible for all students. If the site is contaminated, it should first be capped with clay.

- The desired bed shape should be a flat surface with gentle sloping sides. You may need to use hand tools to break up the surface and reshape it before planting if it has rained.
- The bed may be 6" x 12" above the wood chip paths
- The sides should be sloped at an angle that allows you to plant in them. It is important to plant the sides of the beds as this will help maximize moisture retention and minimize erosion.
- After each plant cycle (such as spring lettuce replaced by summer peppers) add more compost. If you don't have compost at your garden site, Growing Power can help you obtain compost and provide instructions for how to add it.

Seeding and Planting
There are two ways you can plant: direct seeding or transplanting. Some plants, like lettuces, do great if you direct seed them. Most plants that you harvest in root form will be direct seeded (lettuces, spinach, swiss chard, etc.).

Draw rows with your finger and drop in seeds at the distance recommended by the seed packet. Later, thin the plants by snapping off the ones that look spindly or small and leaving the ones that look strongest. Plants that bear fruit, such as tomatoes, peppers, and eggplant, flourish when transplanted. Transplants can be purchased from a nursery, or grown at home or in the classroom

by a window or using a grow light. Dig a hole for each transplant and bury them with enough space for each full-grown plant. Extensive digging is not encouraged in the garden as it disturbs the soil strata and nutrients.

Regardless of the planting method, we recommend you cover all soil surface, including the sides of the bed, with plant material. This will both increase your yield and reduce the frequency of watering, since exposed soil evaporates water more quickly than plants.

For those who are new to gardening, start by growing only a few types of foods, using a few varieties. We don't recommend you grow too many kinds of plants, since it will be difficult to manage and difficult to learn from. For example, a salsa garden makes a great first growing experience. Plant 2-3 varieties of tomatoes, peppers, onions, and cilantro. Round it out with some herbs and edible flowers for beautification and insect deterrent. Record which varieties grow well in your bed, taste good to your students, and produce a lot of fruit. This will give you a diverse harvest and a delicious salsa to share with your students and their families! Each year, add another couple of varieties of plants.

Below you will find a basic guide based on the weather. Consider adding a few from each list and plan your succession, so you will have produce to harvest throughout the summer. With each shift in the weather you can maximize your garden's production.

Developing a Growing Calendar
Perhaps the most crucial piece of maintaining a school garden is having a growing calendar that teachers and students can abide by. A growing calendar can be developed once you know the types of plants you would like to cultivate. Sometimes it is helpful for school gardens to focus on the type of garden they would like to grow (pizza garden, butterfly garden, etc.) and plan their year-round planting around that theme. Other gardens involve students in the process by allowing them to pick out seeds each season and determine when and how they need to be planted.

Cool Weather Plants (April - June and *September-November)*
These plants prefer cooler temperatures and can be planted a few weeks before the last frost. Some can be direct seeded, meaning you plant the seed in the soil in your bed, while others should be started inside and transplanted after they reach a reasonable size. Flowers that do well in the early season include pansies and sweet peas.

Warm Weather Plants
Set out warm weather plants just after the last frost date. Most should be transplanted after being started indoors.

Hot Weather
These plants cannot tolerate frost or cool soil.

Designing and Planning Your Garden

The chart below will help you effectively plan the different phases of your garden planting:

Cool Weather

direct seed

beets
peas
turnips
carrots
radishes

either

lettuce
onions
swiss chard
spinach

transplant

broccoli
cabbage
cauliflower
collards
celery

Warm Weather

direct seed

summer squash
pumpkins

transplant

cantaloupe and other melons
cucumbers and pickles
peppers
potatoes
green beans
tomatoes
corn

Hot Weather

direct seed

lima beans
shell beans
sweet potatoes

either

okra
watermelon

transplant

eggplant

Basic Succession Planting

Well-organized gardeners can get several crops from the same plot by following these succession-planting relays. To do succession planting in the classroom, students can be split into first, second, and third planting groups in order to take turns being responsible for a set of plants, or teams of students can plan out succession planting in one specific plot and determine when and how to rotate the crops.

first planting	second planting	third planting
early peas broccoli spinach lettuce	broccoli tomatoes bush beans cucumbers onions scallions	summer squash arugula lettuce radish bush beans

A basic rule of thumb on lettuces is to reseed every three-weeks. Do not plant all of your lettuce seed at once and consider purchasing several varieties that you can rotate depending on the heat. Slow bolting, summer varieties are recommended for July-August.

Companion planting

Companion planting is a great way to have a healthy organic garden and to teach about the symbiotic relationships that some plants have with one another. Some of the better known examples of companion planting include putting marigolds in the vegetable garden to repel insects, planting legumes to help increase nitrogen in the soil, or the “Three Sisters” squash, corn, and pole bean plant combination. There are many other companion planting combinations to try.

crop:	friends:	foes:
beans	corn, potatoes, rosemary, celery	tomatoes, onion family
beets	onion family, lettuce	arugula, pole beans
cabbage family	onion, rosemary, celery, sage, thyme	tomatoes, peppers, pole beans
corn	onions, legumes, amaranth, potato	tomato, celery
lettuce	scallions, carrots, beans	celery, cabbage, parsley
tomatoes	cucumbers, basil, oregano, onions	corn, potatos, rosemary

Designing and Planning Your Garden

Watering and Maintenance

Your garden needs to be tended to at least three times per week, though more if the weather is harsh. Regular soakings (10-15 minutes on a light spray) are best for your plants, and cuts down on soil erosion. Erosion occurs most when the soil is dry and has not been cared for properly.

- Plants, such as tomatoes and peppers, do not need as much water as lettuces. Check with Growing Power staff for advice on your plant combinations.
- Schools have the most success with watering when students' families sign up for a day to water. At the beginning of each season, have parents sign up to come water once a week (preferably on the same day each week so it's easy to remember). If your school has after school or detention programs, try to coordinate with school administrators to have these students water the garden as an activity.
- Pull weeds, hand cultivate around your plants, and remove dead material on each visit.

Harvesting

- Harvesting on a regular basis is good for the plants and maximizes their productivity. All fruiting plants will continue fruiting if picked weekly. A plant's biological goal is to produce new seed, which is contained in its fruit. If you do not harvest, the plant shuts down new production to mature the fruit already on the vine because it believes it has met its goal. Therefore, the more you harvest, the more it produces.
- Plan on harvesting two times per week during the peak of the summer. Make it a regular habit!
- Lettuces can be trimmed weekly. If you are doing succession, every third harvest, you will pull out the plants and re-seed.
- Look for Growing Power's Spring School Garden Workshop for more information on successfully harvesting your crops.

End of School Year and Clean Up

Since most schools are on summer vacation during the most productive garden months, it is helpful to develop a summer plan for watering, weeding, and harvesting with students, their parents and other community volunteers. It's important to make sure the students know they are included in garden work, even outside of school months. One way to take advantage of early summer planting and encourage student investment is to have your grade plant seeds and leave a positive note to the next class of gardeners before they graduate their class. For example, if 8th graders are moving on to High School, as a graduation ceremony, they can each choose a plant to seed for the next class of 8th graders, along with a note of encouragement and instructions for how to care for the plant. At the end of each growing cycle, before the snow hits please remove all plant material and place in compost bins or bring to Growing Power's Community Compost bin at Iron Street Farm. Store any tomato stakes or other materials in a safe classroom, as these cannot be stored at the garden.

SAMPLE LESSON: Garden Planning

Time:
50 minutes

Grade Level:
Can be adapted for all ages. Most appropriate for Grades 5-6.

Objective:
Engage students in garden planning and introduce them to the essential elements of plant life.

Materials:
Donated seed packets
Planting Chart worksheet or poster

1. Ask students to get into groups of 2 - 3 and pass out a few seed packets to each group.
2. Ask students to look at the back of the package. What information is listed on the back?
    a. Germination time: Amount of time it will take the seed to sprout
    b. Depth: The measurement of how far down in the soil the seeds should be placed when planted
    c. Distance: The measurement of how far apart the seeds should be planted from each other
    d. Maturation: The number of days required for the plant to produce an edible, ripe fruit or vegetable
    e. Sun preferences: The best conditions for growing the seed, such as lots of sun, shade, etc.
3. After students have reviewed the information listed on the back of the seed packets, ask why farmers and gardeners like us need to know this information.
    a. The information can help us plan our farm/garden and grow plants successfully
    b. Ask: What would happen if we ignored all this information and planted these seeds without knowing anything about them? For example, what could happen if we didn't plant things at the proper depth or distance? Seeds could get washed away with watering or rain or get crowded out by other plants. If they don't have enough other plants nearby, they could be more vulnerable to pests or elements like wind and rain.
    c. Why do different plants require different things?
4. Now, let's pretend we are farmers. Which crop will we expect to germinate the fastest? Who thinks they have a packet with a short germination time? Whose packet says 7 days? Start a table on the big sheets of paper for the classroom to list 1st, 2nd, 3rd, etc. (Be sure to record seeds that will ACTUALLY be planted: organic lettuce, herbs, peppers, etc.)
5. Once planted, which one will be ready to eat the fastest? 4 weeks, 6 weeks? etc. List this information on the table as well.

6. The table should include the following information:

Plant Name	How many days will it take to sprout?	We predict this seed will sprout…. (1st, 2nd, 3rd, etc.)	How deep should it be planted in the soil?	What month or time of year should it be planted?	How many days does it take to produce edible fruit?

7. Once you have filled out your table, students can choose which plants they would like to plant in their school garden and order them based on priority of planting. For a more interactive lesson, choose which plants students want to grow and write each one down on an index card and pass one to each student. Based on the information students gleaned from the seed packets, have students order themselves based on when their particular seed would need to get planted.
    a. If possible, follow up with "*Learning about Seasonality*" lesson

Extensions:
For a more in-depth exploration of the elements required for each seed, have students place their seeds in a moist paper towel and put it in a Ziploc bag. Have them observe the seed each day to determine how long it takes to germinate.

Students can also make Sun/Shade maps in the garden space by observing the garden at different periods during the day and making a visual map of where there is sun and where there is shade. Students can then use these maps to plan out where each particular plant would grow best.

SAMPLE LESSON: Seasonality

Time:
50 minutes

Grade Level:
Can be adapted for all ages. Most appropriate for Grades 5-6.

Objectives:
Engage students in garden planning
Discuss the different weather that affects plant growth and local seasonality

Materials:
Fruit and Vegetable game cards
Cool Season/Warm Season growing chart

1. Ask what things students typically eat during different seasons in the year. It might help to talk about what are some traditional things people typically eat around particular holidays (Christmas, 4th of July, Halloween, etc.) List them on a whiteboard or large paper. Ask students: do you think all fruits and vegetables grow and ripen at the same time?

a. No, some crops are cold weather crops and some are warm weather crops. So, which will we plant in our garden first, or during the spring? What kind of characteristics might plants have that make them be successful in cool weather? What about warm weather?

2. Explain basic concept of the cycle of planting. Provide some examples of which plants are early crops, mid-summer crops and late crops.

Cool Season Crops

very hardy:
collards, kholrabi, leaf lettuce, kale, onions, peas, ruttabaga, spinach, turnip, broccoli, brussels sprouts

Plant: April 10th – 25th
Germinates in soil temperatures 35°–45° F
Grows optimally at 60°–65° F

frost tolerant crops:
beets, carrots, chard, herbs, mustard, parsnips, radish, potatoes

Plant: April 25th – May 10th
Germinates in soil temperatures 40°–45° F
Grows optimally at 60°–65° F

Warm Season Crops

tender crops:
snap and pole beans, sweet corn, summer squash

Plant: May 10th – 25th
Germinates in soil temperatures 60°–65° F
Grows optimally at 65°–70° F

warm crops:
lima beans, cucumber, muskmelon, okra, pumpkin, winter squash, watermelon, tomatoes

Plant: May 25th – June 1st
Germinates in soil temperatures 60°–65° F
Grows optimally at 65°–85° F

3. Group students by 3 or 4. Create a seasonal growing chart on a whiteboard or large paper and pass out a set of cards with a variety of fruit and vegetable names to each group. Make sure each group has the same amount and type of vegetable (it may help to color code each group's set of cards). Have the students mark the correct seasons for vegetables in the Midwest in the chart or on the blackboard.
4. Review the chart after all of the teams have placed their answers on it. Discuss the differences between the plants in the chart: Are there any plants that do relatively well during many seasons? Are the any that have a shorter growing window?
5. Ask why students think the types of plants we can grow changes during certain times of year. It may be obvious that it's hard to grow fruit and vegetables in the winter when there is snow, but ask students to think more critically about the characteristics of plants that make them either thrive or suffer with certain seasonal conditions. For example, greens like kale and spinach are considered very hardy crops because when they are exposed to harsher elements like wind and cold, their cells are ruptured and the plants are forced to grow thicker, hardier cell walls.
6. Once students have discussed the characteristics of the different plants, you can use the chart at the front of the room to remove or rearrange particular crops to create a visual calendar of the school garden you're planning.

Seed Starting

Knowing how to start seeds is an essential skill for any gardener, especially in colder climates where starting seeds indoors will give you a jump-start on spring planting. There are a lot of ways to incorporate seed starting into the classroom at all grade levels.

Ideas for the Classroom

- Ask students to design a science experiment that tests out how well seeds do when they are planted in different potting materials or soil types, watered with certain liquids, or placed in varying amounts of light throughout the room
- As seedlings begin to grow, discuss Darwin's theory of evolution and competition, then apply it by selecting the strongest seedlings
- Discuss Native American history and traditional seed saving
- Take a trip to the farmer's market to find heirloom produce. Extract and save the seeds.
- Discuss which seeds need to be planted indoors ahead of time, which plants don't and why

SAMPLE LESSON: Seed Starting

Time:
45 minutes

Grade Level:
Can be adapted for all ages. Most appropriate for Grades 6-8.

Objectives:
Learn about the different properties and functions of seeds
Introduce basic seed starting methods to students

Materials:
Organic, quick-growth seeds like heirloom cilantro, lettuce or spinach
Cheap or donated non-organic seed packets to touch and compare types of seeds
Clear plastic cups
Seed starting soil/potting soil
Recycled containers for planting (large yogurt tub with pre-punched holes, egg cartons, etc.)

Part A. Preparation

1. Have students collect recycled containers the week prior to lesson.
2. Prepare seed samples for each group of students. Each group will be given 3 different kinds of seeds for the second part of the activity. Pour seeds into a clear plastic cup. Write the full name of the seed type on the bottom of the cup.
3. Save all the seed packets so students can use them for the ***Garden Planning* lesson** if they haven't already done so **(page 9).**

Part B. Seeds (25 minutes)

1. Give each group of youth 3 different types of vegetable or fruit seeds.
2. Questions for students to ask (on worksheet at station):
    a. *What are the differences between each type of seed?*
    b. *What is the texture, size, color, shape, smell, feel of each seed?*
    c. *Try and guess the plant that the seed will grow, such as cucumbers, watermelon, etc.*
    d. *Try to guess if you think this plant grows well in the Midwest.*

3. Once students have explored the seeds in front of them, ask each group to share what they discovered about their seeds. Pass around a few examples so that students can see and touch additional varieties of seeds. Make sure as a class they can recognize a few varieties of seeds.
4. Ask students: why are some of the seeds so small? What is the function of the seed? To disperse the genetic material so that the plant can reproduce. All these seeds are holding the necessary genetic material to start the offspring of a unique plant.
5. What are seeds? Seeds develop when the flower of a plant is pollinated and fertilized. A seed is a young plant (embryo) usually with a food supply and a hard outer coat. In general, seeds require air, moisture and warmth for the embryo to break through the outer coat, push through the soil and develop into a new plant.
6. Discuss which seeds/plants grow well in the Midwest and why. Ask if anyone knows the most common crops for farms in Illinois, or varieties of fruits and vegetables that grow well in Illinois. Common crops include onions, potato, pumpkins, spinach and lettuce.
7. Ask students if they have ever planted anything. Do they have a garden in their backyard? How many have grown fruits or vegetables at home? Discuss community gardening. Why is it important to have people nearby that grow fruits and vegetables?
8. Discuss seed variety: biodiversity of plants - such as over 300 varieties of potatoes, tomatoes, etc. Why do you think there are so many different types of one kind of plant? How did this come to be? Discuss genetic variability and the need for different characteristics depending on where the plant is grown and the type of environment it lives in.

PART C. Planting Project (20 minutes)

1. Set ground rules for the seed starting project:
    a. Do not pack down the dirt
    b. Make sure the soil is moist but not too wet
    c. Make sure the seeds are dispersed near the surface of the soil
    d. Once a few seeds are planted, sprinkle the top of the surface with a bit more soil.
2. Each group will be given a container of soil or a seed-starting pellet to start a seed in. Depending on your container size, place only 1-2 seeds in each. Gently place seed at the top of the soil. Don't push it down too far! Notice that the soil is moist, not soaking.

Seed Starting

3. For each group of 2 pass out a pot, soil and seeds. These plants can be kept in the classroom on the windowsill and must be watered consistently. Once the garden is ready, students can transplant them.
4. Each group must label their seeds with: plant name, date started, and expected date of germination.
5. Next steps, remind students, they will be working with their teachers to water the seedlings and check on them periodically.

We try to use [the garden] as a learning tool by giving [students] an emotional connection to it. By allowing things to go wrong and have kids be involved in failure and then take responsibility for that, we're letting them figure out how to fix it. We also have a lot of plant diversity because we give students the opportunity to decide what to plant -- we give them seed catalogues and bring in farmers who talk about what's on their farm and it inspires students to choose what to plant in the garden.

-- Dan Schnitzer
Academy for Global Citizenship, Chicago, IL

SAMPLE LESSON: Seeds We Eat

Time:
20 minutes

Grade Level:
Grades K-2.

Objective:
Familiarize students with different plant parts.

Materials:
Examples of seed-producing plants
"Seeds We Eat" handout
Colored crayons or markers

Seeds We Eat

The seed is the part of a plant that grows in the ground. Some seeds are good to eat.

Here are some examples of seeds we eat. Draw a picture of each one the way it looks when you pull it out of the ground.

Corn	Peas	Beans

Do you notice anything similar about these plants? What makes them similar? What makes them different?

Composting

Compost is the foundation of Growing Power's whole operation. With nutrient-rich, robust compost, you can grow just about anything successfully. At Growing Power, we collect waste from many local businesses and get wood chips from tree trimming companies in order to get the proper ratio of green materials that are high in nitrogen (N) and brown materials that are high in carbon (C). Just as we collect materials like beer mash, coffee, and food scraps from our neighbors, students can help collect food scraps from their families to help get a compost pile started or keep it going.

Compost Essentials:

- *Time*: Growing Power's compost bins measure 4'x4'x5' tall and take about 6 to 9 months to break down. They made out of recycled wood pallets and scrap fencing. This method is a low maintenance way to create a compost pile that you can continuously add to.
- *Location:* Make sure your compost bin or pile is in a convenient location with access to water and room for a wheelbarrow.
- *Water*: The bacteria, or decomposers, in compost need moisture in order to break organic material down. Make sure your compost pile stays moist by creating a classroom schedule or designating specific students who are responsible for watering each day.
- *Air*: Composting bacteria needs are mostly aerobic organisms, meaning they need air to help break material down. If your compost is in an open pile, use pitchforks to turn it about every 7 to 10 days (for a pile about 3 feet by 3 feet).

DO Compost:	DON'T Compost:
Leaves, grass clippings, straw, wood chips	Animal manure (may contain disease organisms)
Vegetable and fruit scraps	Meat, fish scraps, or bone (attracts rodents and smells bad)
Coffee grounds and filters	Fat, grease, oils
Egg shells and cartons	Diseased plants or weeds
Shredded newspaper	

Benefits of Composting

- *Improves soil fertility with the slow release of nutrients*
- *Helps sandy soils retain more water*
- *Loosens and aerates clay soils*
- *Provides food for microorganism that keep soil healthy by regulating the growth of unwanted bacteria and/or fungi*
- *Creates a closed loop in the garden where scraps and waste get put back into the soil*

Composting

Compost in the Classroom
Because composting happens in stages, there are a variety of ways in which students can learn from this process.

- Composting is a daily practice. On the next page, we have included signs to place in the classroom or cafeteria to help students sort garbage and recycling from compost.
- Split students into the "Carbon Team" and "Nitrogen Team" and have them collect material to contribute to the pile
- Students can chart change in temperatures over time and watch as high temperatures break down organic matter

SAMPLE LESSON: Compost Ratios

Time:
20-30 minutes

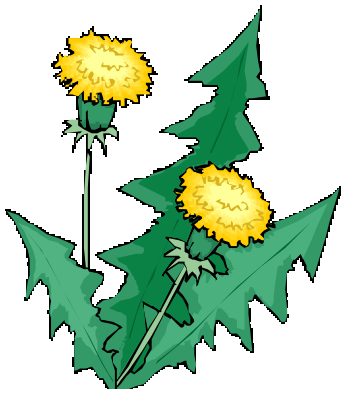
Grade Level:
Grade 6.

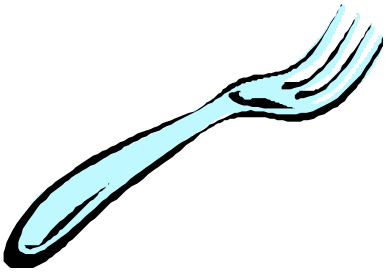
Objectives:
Understand the relationship between Carbon and Nitrogen materials in composting
Understand the concept of ratios and use ratio language to describe compost

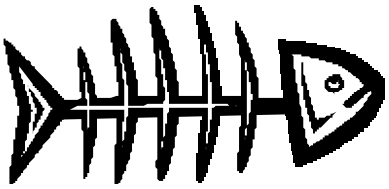
Materials:
C and N materials collected by students

1. Compost piles are very sensitive to carbon and nitrogen ratios. In this outdoor activity, split students into teams of 2-4 and discuss the importance of carbon to nitrogen ratios.
2. Review which materials are carbon materials and which are nitrogen materials.
3. Tell students that they're going to race to show different ratios. The students will have 2 minutes to collect materials outside and display the materials in the proper ratio in their workspace before the teacher calls time.
4. Call out different C:N ratios and give groups 2 minutes to collect materials.
5. Once they have returned and set up their ratio display, ask each team to describe their ratios using ratio language (i.e. The ratio of grass to woodchips is 2 to 1 because for every 2 handfuls of grass there is one handful of woodchips).
6. Keep score and at the end award a winner.


COMPOST
ME!
A+







DON’T COMPOST ME!

Vermiculture

Vermiculture, or **Vermicomposting**, derives from the Latin word *vermis* meaning worm. Vermicomposting is an effective way to turn kitchen waste into rich, high-value compost. It is also an effective teaching tool for children to learn nutrient recycling and the benefits of worms for our earth.

Some facts:

- Worms have five hearts.
- Worms breathe through their skin. A worm's skin must remain moist for them to take in oxygen. This is why a worm cannot be exposed to sunlight.
- The pharynx inside the worm's mouth grabs food. The crop then stores and begins to breakdown the food. From there, food moves to the worm's gizzard, where it is chewed.
- Worms need sand in order for their gizzards to breakdown food.
- A worm matures in only eight weeks.
- Worms can deposit two to three cocoons a week. At the end of three weeks, a cocoon will hatch as many as five worms.
- Don't cut a worm in half! The worm will not grow into two separate worms. It will die. Regeneration only occurs if a very small piece of the worm is cut off.

Building a Worm Farm

Materials:

- An aerated container (may be as small as a large Cool Whip container). Wood containers often work best but are not necessary. Holes should be drilled into the bottom to assure proper drainage
- 10 red wriggler worms (this amount reflects the size for a small container)
- Mushy kitchen scraps (let food waste sit in an air-tight container for two to three weeks)
- Water
- Breathable fabric such as burlap to cover the worm bin

Instructions:

1. Punch or drill holes in the sides and bottom of the container and the lid for air.
2. Fill your container with food scraps and compost.
3. Add the red wrigglers. Observe how they bury themselves immediately to avoid sunlight.
4. Cover the worm bin with burlap.

Vermiculture

Bedding:
Bedding provides the worms with a cool and moist environment. In the bedding, the worms will tunnel and digest the food scrapes along with the bedding. Types of bedding used in worm bin are shredded newspaper, shredded cardboard, old leaves, straw, or composted manure (rabbit, horse, etc.). Fill the bedding to the top of the bin.

Location: Temperature and Moisture
Red wrigglers perform at their best when moist and well ventilated. The ideal temperature range is 55 to 75 degrees. Avoid freezing temperatures and heat in excess of 80 degrees. Keep the worm bin covered and out of direct sunlight (burlap cloth works well for this). Basements, cool garages, and kitchens are all suitable locations. You will also have to raise the bin off the floor so that air can circulate up through the air holes. Don't worry – the worms won't crawl out.

Bins should be kept moist (worms need moisture to breathe) but should not be kept wet. If you flood your worms, they will drown.

Feeding:
Worms are vegetarian. Do not feed your worms meat or bone scrapes. The worms should be fed two to three times a week (depending on the number of worms in your bin and how much compost you initially fed them) by burying food scrapes under the bedding. The feeding ratio is 2:1, two pounds of worms per pound of garbage (there are roughly 1,000 worms in one pound). The smaller the food scrapes, the quicker the worms will be able to digest the matter.

DO Feed:	DON'T Feed:
Coffee grounds and filters Tea bags Crushed egg shells Citrus peels Cereal/breads Fruits and vegetables Grass clippings, leaves, etc	Meat or fat Grease and oils Dairy products Pet waste Plastic wrap or aluminum foil Chemicals, glass, metal

Observing the Worm Bin:

- If the worm bin smells sour, add eggshells, soil, sand, or more newspaper. A bin will smell sour when it is too wet.
- Check to make sure that your worm bin is fluffy, not compact.
- For additional fertilizer, place a container under the bin when you water. Once the water is collected, pour it on your garden or house plants once a week. Be sure to use it immediately, as the liquid has living microorganisms that will become anaerobic within a day.
- Worm bin compost can be harvested at roughly eight weeks. Put a screen with food scrapes (worms love bananas) on the top of the soil. Periodically remove your worms and place in your garden or in a new bin over a one to two day period.

SAMPLE LESSON: Worm Senses

Time:
1 hour and 30 minutes

Grade Level:
Grades 6-7.

Objectives:
Develop and practice inquiry skills as well as the ability to identify connections
Practice setting up and running an experiment based on a hypothesis

Materials:
Worms
Worm bins
Note paper or science journal
Test materials from student-generated materials lists

Part A. Introduction (20 minutes)

1. Select 4 volunteers that are okay with being blindfolded.
    a. Give each volunteer the title of "smell," "hear," "touch," or "see."
    b. Each volunteer describes their observations by using only their sense that has been assigned
    c. Ask other students to record the volunteers' observations as they tell the rest of the class
2. Discuss observation versus inference
    a. Look back at the observations list the participants created earlier.
    b. Simply describe observations and inferences
        i. Observations: description of what you sense (5 senses)
        ii. Inferences: a conclusion based off observations or information
    c. Observe a person (a teacher or student volunteer)
        i.Have participants call out observations and clarify inferences.
    d. What can observations do for us?
3. Ask students to get into groups of no more than 4 around a worm bin
4. Students will come up with a list of observations -- NO TASTING -- of the worms and bins.

Part B. Setting up an Experiment (50 minutes)

5. Give students 5 minutes to come up with a list of observations about the worms and a list of questions. For example, if they noticed the worms are moving upward toward food scraps, they might ask, "Can worms smell?" Each group will generate a list of questions to test and choose about 5 to test.

6. Ask students to write down a hypothesis, or question, for one of their observations. They will then develop a list of experiments they could run and tools they would need to come up with an answer to their question. Students should also record what they think their findings will be. Encourage students within each group to have different predictions than their teammates.
7. As a whole group, share questions and record them.
    a. Ask the participants how they can find answers to the questions we have about worms.
    b. As a group, decide on what questions we may be able to test today.
8. Ask students what precautions they need to take when testing the worms. Make a list somewhere that is visible to all students. Review their precautions and the following list. Briefly check for understanding of why these precautions are in place.
    a. Worm safety precautions.
        i. Always choose the health of the worm over your test
        ii. If taking the worm out of the soil, keep it moist by a wet paper or misting it
        iii. Do not keep the worm out over a period longer than 3 minutes
        iv. Do not place worm in puddle of water
        v. Do not stretch or poke or smash, or eat, or fry worms
9. Test your questions
    a. Groups have time to test their questions with the given materials. Ask them to record the information in their notebooks or on lined paper
    b. Share out

Part C. Post Experiment (20 minutes)

10. After they have completed their experiment, students will come up with some basic elements that they think are critical for the worms to survive. These will be based off what we found during observations of the worms. Record these conjectures.
    a. Light, moisture, materials, texture, movement, type of food
11. If it hasn't come up, ask the question: What might be affected if we change the food we are giving the worms?
    a. Have them share their guesses and explain why.
    b. How can we determine if food makes a difference?
    c. What is the benefit of knowing how different foods make a difference to the worms and how well they can decompose?
    d. What are some different kinds of food may we want to test? (fruit, veggies, paper)
12. Have students write an experiment conclusion that addresses their initial hypothesis. Did they guess correctly?

Mushrooms

One unique and productive way to use vertical and indoor space is to grow mushrooms. Mushrooms are the reproductive organs of mycelium, which is a fungal organism that grows through intricately woven mats of white-ish threads. This mycelium mat can often be observed underneath tree bark or wood chips. At Growing Power, we use substrates like straw and coir (fiber from coconut husks) as materials that mycelia can "colonize" and reproduce in rapidly. Mycelia can be housed in recycled materials like old feed bags, glass jars or in drilled holes in logs. In a relatively short period of time, the mycelia produces mushrooms that can be harvested, sold, eaten or dried for future use.

Building Mushroom Jars

Materials

- Straw and/or coir
- Large sterile trash can or barrel
- Scrap fencing, chicken wire or mesh.
- Mason's lime
- Mushroom spawn (we buy ours from Field and Forest: www.fieldforest.net)
- Mason jars or recycled glass jars from home (preferably quart size)
- Hammer
- Nail
- Permanent marker

Instructions

1. Chop a bale of straw into small 3"-4" pieces using scissors or by weed-whacking the straw inside of the garbage can.
2. Add ¾ lb. of Mason's lime to about 52 gallons of water (or a mostly full barrel). Before it's diluted, the lime is mildly caustic, so be careful!
3. Soak the straw in the lime water for 24 hours to pasteurize. Straw "tea" is a natural herbicide so be careful where you dispose of it. Always use gloves to handle wet straw.
4. Using gloves to arrange straw over slightly elevated fencing, chicken wire or mesh, drain the straw for about 90 minutes, or until you can squeeze one drop of water out of a fistful of straw.
5. Pack your jar with a large fistful of the drained straw so that it fills the jar about one-third of the way. Sprinkle about a teaspoon of the mushroom spawn on top of the layer of straw. Repeat until your jar is full, making sure the straw is packed in tight.
6. Screw on the lid to the mushroom jar and, using the hammer and nail, poke about 5-6 holes in the top so that air can circulate during the inoculation phase.
7. Write the date, mushroom species name, and substrate type (i.e. straw or other material if you're experimenting) and store in a warm, dry, and dark place for approximately 3 weeks.
8. After the 3-week inoculation period, move the jars to a place with light and remove the lids. In about 1-3 weeks, the jars should "fruit" mushrooms and can be harvested for eating!

Winter Garden Lessons

While winter in the Midwest is not an ideal time to introduce students to the garden, it is a great time to start discussing broader food issues and how they connect to the work that they will be doing in the garden starting in the spring. Here is a sample of a lesson that will help jumpstart your discussions about food systems.

SAMPLE LESSON: What is a Food System?*

Time:
50 minutes

Grade Level:
Grades 6-8. See "Adaptation" for Grades 9-12.

Objectives:
Learn how to characterize a food system.
Determine the basic differences between a local food system and a conventional and global food system.
Be able to name different players involved in the food system and will gain an understanding of their various roles.

Materials:
Markers
Food system role cards, one set per group
Masking Tape
World Map
String
One of each: 7 varieties of fruit or vegetables from various sources (local and global varieties. Make sure country of origin is known or labeled)
Post-Its or note cards that students can use to label fruits for the 'mileage routes'
4 pairs of scissors

**Adapted from Heifer International's The Food Project "French Fries and the Food System"*

Part A: Introduction (10 minutes)

1. Explain to students we are going to trace the route of food and embark on a long trail called the food system. We are going to use examples of common fruits and vegetables we see everyday to learn about food production. Give a definition of the food system.
    a. Definition: *The interconnection of agriculture systems, including their economic, social, cultural, and technological support systems, and systems of food distribution and consumption.*
2. Show a sample fruit. Ask, how many of you recognize this? Where have you seen it? Does anyone know where it comes from or where it was grown? What does that sticker say? This is what we are going to learn about today.
3. Each group has been given a different fruit or vegetable. Your task is to determine the route this food took to get from the farm to the table. You can be imaginary, but think realistically. Some groups have fruits and vegetables from far away places, and some have fruits and vegetables from nearby. We are going to explore today some of the differences between food from nearby farms and food from far away.

Part B: Mapping the Mileage (simultaneous with Part C)

4. Ask students to come up, one group at a time, to figure out how far their fruit or vegetable traveled.
5. Using the scale on the map, each group will estimate the mileage between Chicago and the location where your food originally came from.
6. Mark the locations on the map with post its or stickers and place a string up to represent the route. Finally, label the string to indicate the food to which this route corresponds.

Part C: Tracing the Route (30 minutes)

7. The next part of the activity is to write a food system story that accompanies your fruit or vegetable. Pretend your fruit or vegetable has been on a journey since the day it was planted. Where has it traveled? Who has it met? Who has handled this fruit or vegetable?
8. Challenge question: Tell students to think about how the resources used and people involved to produce it might be different if your food was grown regionally or far away.
9. Can you guess how many people might have handled this apple before it got to you? Can you guess how many days ago the apple was harvested? What about when the seed was planted? Explain, today's activity is going to help us explore some of these questions.
10. Tell the students, in their small groups, to brainstorm all the jobs or people that are involved in getting the apples from the farm, where it was grown, to you at the grocery store. A good way to start brainstorming is to think about the string for your food on the map, knowing that at one end is the consumer and the other end is the producer. Think about the people in between. How might the players involved with the local apple be different than those with the conventional apple? Will they have the same players?
11. As the students think of ideas, have them fill out the chart on the student activity sheet. Have them write their stories in their notebooks and be prepared to present it to the class.
12. Once students have filled out their chart, pass out a stack of cards to each group, listing the key players. (One side of the card gives the name/role; the flipside gives a brief description of their role). Hopefully, the stack of cards corresponds with the list created by the groups, though it may include a few additional players.
    a. Depending on the age of the students, it might be helpful to pass out these cards sooner, to help give them some direction and ideas for the story.
13. Students should end up with a story about their fruit or vegetable that they are going to present to the class. They should also tell their classmates the mileage they calculated for that fruit or vegetable.
14. How many tanks of gas for a big truck or a plane were used? How many times does your family get gas each week, think of how much that would be for this food!

15. Ask students to present: where was your food grown? By whom? What size farm do you suppose? Where did it travel? How did it travel, by bus, by plane, by truck? Where was it sold- Mercado, grocery store, farmer's market? Who bought it? Their responsibility is to create an imaginary trade route (as realistic as possible) for their sample food.

Reflection: Comparing Models (10 minutes)
Depending on the age of the students, this activity might vary.

16. Start by asking students to share their observations about the food they researched. What did they learn about this food or about the food system? Give students time to share impressions and insights.
17. Next, ask students to think about some of the differences between each food. What does it make them think about? Are the systems equal? What are some of the differences between the two models? Some responses that might arise are noted in the table below. Guide students towards recognizing these key characteristics.
18. Summarize by asking: what are benefits and negatives for each food system? Ultimately, the food is healthier and fresher and it is more equitable for the farmer's because they get a greater portion of the dollar to sustain their farm from a local food system

Conventional Food System	Local Food System
Food travels much further, sometimes by airplane and from regions very different than Chicago	Food travels shorter distances and comes from the region, nearby states or counties
Many key players are involved	Less key players are involved
Farmer is left with very small portion of the dollar, and thus may not have enough money to support a family	A greater percentage of money paid by the consumer goes directly to the farmer
Food is not as fresh because it could take many days to be shipped and processed (May arrive 3-4 weeks after it was harvested!)	Food is fresher, and thus has a higher nutrient content because it travels shorter distances (may arrive day after it was picked!)
Food is less healthy because produced with more pesticides	Food might be organically produced, or with IPM or other sustainable processes
Less equitable for the players involved	More equitable, just for the players

Adaptation:
For an older group of students (7th-12th grade), have students brainstorm the food system roles independently in their small groups. As they think of key players, each of players should be recorded on index cards, one card per player. As players are being brainstormed, one person in the group should be selected to represent that player. Provide 3 index cards listing key players to get the groups started. Let's start with 3 volunteers to demonstrate. The farmer, this is the person that produces the food. (Encourage students to think about what they already know about the food chain.) Another person involved might be a trucker, a person who transports the food from the farm to the grocery store. How many truckers might be involved?

Food System Role Cards
Make one set for each group, folding them in half so that the definition is on the back of the cards.

Role	Definition
Supplier	Company that produces farm inputs such as seeds, fertilizers, pesticides, compost, manure, fuel, and machinery.
Producer	Farm or fishery that grows the food.
Processor	Takes the raw product from the producer and converts it into a food product.
Distributor	Buys large quantities from various producers and sells to various stores usually under a contractual agreement. May store product in a warehouse.
Trucker	Each sector will have a transportation component. The farm needs to move the food to the processor, who needs to move it to the warehouse or the distributor who will then move it to the store.
Retailer/Store	The supermarkets or food stores that sells the final product to the consumer.
Consumer	The person who buys or uses the end product- the food.

Spring Garden Lessons

Spring is perhaps the most exciting time to be in the garden because students can experience the full life cycle of plants. It is a great time for experimenting, setting up maintenance procedures, and letting youth use their senses to explore the garden. Allowing students to guide the development of the garden during the spring will encourage greater involvement later on.

SAMPLE LESSON: Grow, Garden, Grow!

Time:
Ongoing

Grade Level:
Grades 11-12.

Objectives:
Explore the relationships between soil, productivity, plant type, and garden design
Students plan and maintain the garden for the spring season
Gain experience in data collection and processing
Utilize the principles of the scientific process in a long-term, hands on experiment
Apply the concepts of geometric modeling in the garden

Materials:
Seeds
Maintenance Worksheets (can be generated by students or teacher; see example)

1. Depending on the size of your class and garden, divide students in half or split them into smaller groups.
2. Tell each group that they will be the owners of a brand new garden bed! Just like real farmers, each team will be responsible for growing as much as possible. Make this into a healthy competition and have a big celebration at the end of the school year for the most successful team. Be creative with prizes; you could use veggies from the garden to make pizzas for the winning group or let them off the hook from weeding for a week.
3. Each group will decide what they would like to plant there (with the seeds available) and how they will take care of the soil. Provide students with examples of what's possible and encourage them to come up with creative amendments (making sure that they are only using products that are safe for an organic garden).
    a. Example: Students could plant their bed with all of the same plants but divide their garden bed in half and fertilize one half with compost and leave the other half alone.
4. Within their groups, students will set up a garden chart so that their bed receives care and that they are keeping track of what they are growing and planning accordingly. Their maintenance schedule should include places for them to collect data such as what plants have germinated, average plant height, any signs of disease, and weight harvested (*see sample garden chart*). If students have experimented with different methods for fertilizing or are trying to compare different parts of their beds, they can keep separate record sheets.
5. Check in with groups periodically to see how their maintenance and recording is going.
6. As the school year draws to a close, have the students tally their yields and write a final summary about their experiment detailing what was successful and what they would do differently next time.

Summer Garden Lessons

Summer months are generally a challenge for most school gardens. While it is the most productive and rewarding time to be there, it is also typically the hardest time to draw students and their parents into the garden. Some schools solve this problem by hosting summer volunteer or extracurricular programs in their gardens or by holding weekly potlucks to help engage parents and community members and tackle some summer garden maintenance. You can also hold an end of the school year potluck in the garden and auction off plots for a family to adopt for the summer. Make it fun and playful so that taking care of the garden will seem more like an enjoyable family activity rather than a chore.

> *Every summer we run parent workshops to keep them engaged. It's a great time to do cooking demonstrations out in the garden and the most fun time to have people participating.*
>
> *--Dan Schnitzer*
> *Academy for Global Citizenship, Chicago, IL*

SAMPLE LESSON: Garden Taste Test

Time:
1 hour

Grade Level:
Grades 3-6

Objectives:
Identify different plants from the garden and trace them to their origins
Discuss the global and historical movement of food
Introduce healthy and local food to students' diets

Materials:
Paper
Colored pencils or markers
Plates
Water for washing
Bowls
Salad dressing
Knives and forks
Cutting boards
Laminated map of the world

1. Ask students what their favorite foods to eat are and why. Ask if they think those foods are good for them and why. If some of them are not so healthy, why aren't they good for you?
    a. Why is it important to eat at least *some* healthy foods every day? Healthy foods give us energy and important vitamins and minerals that help our bodies function correctly. If we don't eat some fresh, healthy food every day, we can easily feel sick, tired, have too much energy, or not be able to concentrate. How many of you have been in class and felt this way? How did it affect your learning?
2. Today we're going to go out in the garden and practice harvesting and eating healthy foods.

a. Split the group into 3 teams and allow each team to pick out 2 items in the garden that they like. Encourage them to use all their senses when choosing food and to carefully smell, touch, or even taste plants before harvesting them
b. *Note:* Go over the proper way of harvesting plants in the garden before students start the exercise. You may want to have them choose which plant they want to use, point it out to the teacher or other adult volunteer, and then harvest it together so they can see the proper technique.

3. Once all the teams are done, have them bring their harvested produce back to a clean table. If you want, you can spread a world map out over the table and ask students to place their produce over the part of the world that they think their produce originally came from.
    a. *Note:* You may have to do some research on plant origins and prepare a brief fact sheet for students.
    b. Explain how many plants that we still eat today have been cultivated over thousands of years. During that time, plants and seeds moved around the world as people traveled to different places for trade. Over time, some plants have become available all over the world. Do you know where the tomatoes you eat at home come from? Or the lettuce? Nowadays, most produce travels long distances on trucks, trains, and planes to get to stores where we buy them. In our garden, vegetables only have to travel a few feet to be washed, chopped, and eaten!

4. Once you have discussed the origins of some of the plants, ask students to carefully wash the produce that they've harvested to remove all of the soil from them.

5. Using kid-friendly knives, or with the help of adult volunteers, chop the produce that students harvested. Put some of it out on small plates for students to sample. With the remaining produce, put it all in one large bowl for a class salad.
    a. If available, make salad dressing from scratch by mixing oil, vinegar, herbs from the garden, salt, and pepper.
    b. Dress the salad and serve on paper plates. Enjoy with students!

Extension: In the three groups, have each group of students make their own salad using the chopped produce that they think will make the tastiest combination. Have each student try the three different salads and then vote on which they enjoyed the most.

Fall Garden Lessons

After the summer months, fall is the time to get students out into the garden again, plant some hardy crops, and ultimately wrap up the Midwest growing season. Leap right back into gardening by establishing a new watering, weeding, and harvesting schedule so that students can be responsible for a thriving garden.

SAMPLE LESSON: Cultivating Food Security

Time:
Ongoing

Grade Level:
Grade 11.

Objectives:
Introduce and discuss the concept of food security
Explore how to grow based on a target population
Use math to calculate how to grow food to support a community
Develop a process for determining yields, costs, and space to create a community food system

Materials:
Garden Chart Worksheets (can be generated by students or teacher; see example)
Seeds, if implementing students' plan in the garden

1. Explain to the class that today you will be discussing the concept of "food security." Those are two pretty familiar words; does anybody know what it means?
    a. Definitions include: "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life;"[1] "Food security happens when all people at all times have access to enough food that is affordable, safe and healthy; is culturally acceptable; meets specific dietary needs; is obtained in a dignified manner; [and] is produced in ways that are environmentally sound and socially just."[2]
    b. Ask: does anyone have examples of what it means to be food *insecure?* What kinds of things make it difficult to obtain food security? Answers could be: not having access to a car, not having any grocery stores in your neighborhood, not having money to pay for foods, not able to buy necessary food using food stamps, etc.
    c. Once students have a grasp on food security, explain that over the course of the next few weeks (depending on how frequently your class meets), students will be working on planning a food *secure* community. The students must carefully calculate their desired yields based on a hypothetical community that they need to feed. For example, teachers can use an imaginary 100-person town, the population of the school, or the number of students in the classroom.

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[1] *Food Security*. World Health Organization. 25 Jan 2012. <www.who.int/trade/glossary/story028/en/>
[2] *What is Food Security?* Food Security Network of Newfoundland and Labrador. 2 Feb. 2012. <www.foodsecuritynews.com/What-is-food-security.htm.>

2. To begin this activity, give each student a few seed packets and tell them to look at the instructions for planting that specific seed on the back of the packet. Go over what each of the specifications mean, such as seed spacing, sow dates, etc., and make sure students feel comfortable finding that information for each seed.

3. Split students into teams of at least 4. Explain to them that based on this information, they will have to calculate how many seeds to plant, how much space they will need, and what the estimated cost will be to attain food security for their "community." Keep in mind that people in your community need to eat three times a day and that their ideal fruit and vegetable intake should be determined by the students (or entire class) before they begin their calculations.
    a. *Note:* Students may want to pick plants that are already growing in your school's garden so that they can estimate how much their harvest yield for each plant will be. You could also provide an estimate of how much each type of plant will yield so that students can work backwards to decide how much to plant.

> ***We have advanced math students and beds that are shaped like amoebas of all different shapes and sizes. We gave the math students the challenge of computing the size of the beds and figuring out how much cubic yardage of compost we needed to order.***
>
> *--Cathi Knickrehm*
> *Hatch Elementary School, Oak Park, IL*

4. Have students plan out their food security plan using the *Garden Chart* worksheet.

5. After students have completed their calculations, they will write a proposal that details who is in their community, where they plan to grow their food, and how they plan to give people access to the food. Their report could also offer a reflection on the exercise, including answers to the following questions:
    a. What was difficult about making this plan?
    b. Does making a plan like this seem relevant to your actual home community? Why or why not?
    c. Calculating yields can be difficult and somewhat inaccurate. Is there any other research that you would want to do before beginning a food security project?

Name of Student	Crop	Variety	Harvest dates	Sowing period	Sow every X days	Crop Spacing (aXb = a inches in rows, b inches between rows)	Number of rows needed	Square Footage Needed	Price of total seeds needed/ Any special tools needed	Sources of seeds	Harvest Goal
Example: Amelia	*Spinach*	*American Spinach*	*Apr 19 - Dec 1*	*Mar 1 - Oct 15*	*Every ten days*	*6X6*	*9 10ft rows, with 6 inches between*	*20 sq ft (2ftx10ft)*	*2 oz seed = $16*	*Seeds of Change*	*12lbs/month (during Spinach growing months: April - Nov)*

SAMPLE LESSON: Garden Graphing

Time:
50 minutes

Grade Level:
Grade 8

Objectives:
Familiarize students with the plants growing in the garden
Graph relationships between two or more objects
Use the concept of "slope" to analyze situations and solve problems

Materials:
Twine
Yard sticks (or other measurement tool)
Garden Map worksheet

Preparation:

1. Make your garden into a living "X-Y graph" by marking two sides of the garden at a 90-degree angle with twine, rope, or tape to make an interactive x- and y-axis. Make sure it's visible and will stay in place throughout the entire activity.
2. Using the quadrant that you have created, draw a scaled map of your school's garden, choosing several of the plants to measure distances between. You will have to decide which units to use before you begin mapping. For example, to make for easy measuring, 1 yard = 1 unit on the graph, such that a tomato plant that is 1 yard away from (0,0) would be both 1 yard to the right and up from where your marked axes cross.
    a. *Note:* you may want to choose plants that are distinctive in your garden so that students are not confused by multiple locations. Garden signs, carefully placed tools, and other stationary items make great objects for this activity, too!
3. Make a copy of your map as a handout for each student. Generate a key with the calculated distances (or slope) between the plants on your map to check students' work.

Instructions:

1. Discuss the equation for a line with your students: $y = mx + b$.
   a. Go through each component of the equation to make sure that each student has a clear understanding of what each letter represents.
2. What does the *m* represent? The *m* in this equation represents the slope of the line. Slope can be calculated as rise over run or $Y_2 - Y_1$ divided by $X_2 - X_1$. Today we're going to discuss the other information that slope gives us, such as the distance between two objects.
3. Handout the map of the garden. Explain to the students that today the garden is a real live graph! Using yard sticks (or your predetermined unit of measurement), students will locate the (x,y) coordinates of all the objects marked on the map – kind of like a treasure hunt. They will then calculate the slope between those objects. They can do this in pairs or teams, depending on how many measuring devices are available.
   b. *Note*: It may be helpful to have some questions already written out on your garden map worksheet. For example, "What are the coordinates of the first green tomatoes that are sprouting?" "What are the coordinates of the garden sign?" "What is the distance between the two?"
   c. Students may have to estimate to the nearest unit.
4. Give students time to create their garden graph and calculate the slopes between objects. You can extend this activity further by having students solve the equation for an imaginary line based on the objects mapped in their garden chart. For example, if the slope of the line between the tomatoes and the garden sign is 2 and the tomatoes are at (3,2), what is *b* on the imaginary line that intersects both objects?
5. Once the students are done calculating, have a report-back in which students discuss what they found. Ask: how can knowing how to calculate slope be helpful in real life?

Resources

Illinois School Garden Information and Programs:

Seven Generations Ahead
Chicago-based organization promoting sustainable communities and farm-to-school education. Check out their "Fresh from the Farm" Resource Center for gardening, programmatic, and curricular resources.
www.sevengenerationsahead.org

Illinois Master Gardener Program
More information about Master Gardeners and the expertise they can lend to school gardens.
http://web.extension.illinois.edu/mg/

Garden Planning and Design:

Mother Earth News
Interactive vegetable garden design program and information about seasonal planting
www.motherearthnews.com/garden-planner/vegetable-garden-planner.aspx
A 30-day free trial is available. After that, teachers can subscribe to the program to use with their students at a cost of $40.00 for up to five classes per year.

Garden-Based Curriculum

California School Garden Network
www.csgn.org/page.php?id=22

National Environmental Education Week Curricula
K-12 curricula ranging from learning about soil to developing themed gardens.
www.eeweek.org/resources/garden_curricula.htm

The waterCAMPws
Water-related Science curriculum by IL State Standards, especially great for studying soils.
www.watercampws.uiuc.edu/waterclear/labs/index.htm

Worm Curricula and Activities:

The Adventures of Herman (in English and Spanish) http://urbanext.illinois.edu/worms/
WormWorld: http://yucky.discovery.com/flash/worm/
Urban Worm Girls in Chicago: www.urbanwormgirl.com
Local resources and information about vermiculture

Mushroom Resources:

Field and Forest: www.fieldforest.net
Spawn and some equipment.

MykoWeb: http://mykoweb.com/
Lots of resources and information about mycelium

Nutrition Programs and Curricula

Chefs in the Classroom: www.goforthegoldcps.org/citc/
Common Threads: www.commonthreads.org
The Good Food Project: www.thegoodfoodproject.org