ADVENTURES IN LEARNING

A TEACHER’S GUIDE TO EXPLORATION AND DISCOVERY IN OKC SCHOOL GARDENS

March 2015

urbanagokc.org
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WHY SCHOOL GARDENS?

Research has demonstrated that school gardens have the following benefits:

- Significantly increase science achievement scores
- Improve social skills and behavior
- Instill appreciation and respect for nature
- Improve life skills, including working with groups
- Increase interest in eating fruits and vegetables
- Increase consumption of fruits and vegetables in adolescents
- Have a positive impact on student achievement and behavior

Source: Kidsgardening.org

TEACHERS, you can use your school garden to help students learn the art, science, mathematics, nutrition, and practical application of growing, harvesting, and eating healthy food.

School gardening engages students by providing a dynamic environment to observe, discover, experiment, and learn.

School gardens are living laboratories where interdisciplinary lessons are drawn from real life experiences, encouraging students to become active participants in the learning process.
Weather is a key factor in the success of a garden. Rain, sun, and adequate temperatures are all necessary for garden plants to thrive.

While Oklahoma’s hot, dry summers can be a problem for many plants, there are ways for gardeners to “beat the heat.”

First, select seeds and plants that are suited to our local climate conditions and plant them at the proper time. (See Appendix A: Spring and Fall Planting Charts).

Next, prepare the soil with lots of moisture-holding compost and cover the soil with thick layers of mulch material (straw, shredded leaves) around the plants.

Finally, provide regular moisture to the plants according to their needs, more when temperatures are hot and when rain has been scarce.

Also be sure to take advantage of the milder fall temperatures by planting cold-hardy vegetables in the autumn.

Gardeners can grow plants like lettuce, kale, spinach, and other greens throughout Oklahoma’s sometimes-harsh winters if low tunnels or hoop houses and mulch are used to protect the plants.
For better chances of success, choose plants that thrive in our climate and tough varieties that do well even in heat and drought for summer plantings. You can also plant cool-weather vegetables in fall and early spring. Find more information from the Master Gardeners at the OSU-OKC extension service.

**Herbs**
Herbs are reliable performers in Oklahoma gardens: easy to grow, and interesting for students to smell and taste.
- Basil (annual)
- Parsley (bi-annual)
- Thyme (perennial)
- Oregano (perennial)
- Sage (perennial)
- Mint (invasive)
- Lemon Balm (can be invasive)

**Vegetables**
- Perennials:
  - Asparagus
- Cold-hardy:
  - Lettuce
  - Spinach
  - Swiss chard
  - Garlic (plant in fall)
  - Carrots
  - Beets
  - Green onions
  - Kale
- Warm-weather
  - Cherry and grape tomatoes

**Fruits**
- Hot peppers (jalapeno, for example)
- Okra
- Green beans (bush types)
- Armenian cucumbers
- Southern peas
- Melons
- Watermelons

**Flowers**
Don’t forget the flowers, which help attract beneficial insects and pollinators, as well as beautiful butterflies! Flowers can be planted directly in the garden bed (if annuals) or nearby (if perennials).
- Cosmos
- Marigolds
- Borage
- Sunflowers
- Zinnias
- Daylilies (perennial)
- Shasta Daisies (perennial)
- Rudbeckia (perennial)
- Catmint (perennial)
- Milkweed (perennial host plant of the Monarch butterfly)
Fall is a wonderful time for gardening! The milder temperatures mean that plants require less watering; and cool-weather plants started early in the autumn can live through the winter—with a little protection from mulch and a low tunnel or hoop house.

To assist in lesson planning, garden activities are listed in the month generally appropriate for gardens in Oklahoma City. Curriculum resources for helping to apply garden activities to lesson planning can be found on page 10.

### September
- Start class observation journal to document garden data and observations
- Continue harvesting summer plantings
- Remove dead or ailing summer plants from garden and place in the compost pile
- Perform tasting, cooking and/or preserving of harvest
- Start compost pile
- Water
- (Early September) Plant onions, cold-hardy seeds, cold-hardy transplants
- Save seeds from harvested produce (ex: watermelon, tomato, pepper seeds)
- Plant perennials such as herbs, fruit trees
- Apply mulch in unplanted areas to protect and enrich the soil
- Continue harvesting summer plantings
- Watch the weather, be alert to first frost and harvest remaining summer crops
- Harvest greens or cold-hardy crops
- Plant overwintering flower seeds

### October
- Protect plants from early frosts with low tunnels, hoop houses or other methods
- Plant cover crops in unplanted areas to protect and enrich the soil
- Plant garlic
- Watch the weather, be alert to first frosts and harvest remaining summer crops
- Continue harvesting greens or cold-hardy crops from hoop houses or low tunnels
- Plant spring bulbs (such as daffodils)

### November
- Review results of observation journal; discuss successes and failures
- Continue harvesting greens or cold-hardy crops from hoop houses or low tunnels
- Clean and maintain tools
Help your students learn skills of planning and preparation—even as they get excited about planting the garden in the coming spring.

**January**
- Start class observation journal to document garden data and observations
- Continue harvesting fall-planted greens
- Plan the garden semester: seeds, plants, planting dates
- Create a garden sketch
- Set your time table of planting
- Select and purchase seeds
- Harvest greens from hoop houses
- Clean and maintain tools
- Add organic fertilizers and soil amendments to garden beds

**February**
- Start seed indoors or in greenhouse for early season / cold-season crops
- Harvest greens from hoop houses or low tunnels
- Prune fruit trees to aid growth
- Start seed indoors or in greenhouse for main season plantings (tomatoes, peppers, melons)

**March**
- Prepare garden for planting
- Plant early crops: potatoes, onions, greens
- Direct seed early crops: greens, radishes
- Harvest greens from hoop houses or low tunnels
- Plant perennials such as herbs, fruit trees, asparagus
- Start seed indoors or in greenhouse for main season plantings (tomatoes, peppers, melons)

**April**
- Harvest greens from hoop houses or low tunnels
- Plant main season crops (tomatoes, peppers, melons) after last frost date (see schedule)
- Protect transplants if late frost is predicted
- Control pests with Integrated Pest Management techniques (IPM)
- Fertilize and mulch
- Water

**May**
- Plant main season crops (tomatoes, peppers, melons) after last frost date (see schedule)
- Fertilize
- Mulch
- Weed as needed
- Water
- Control pests with Integrated Pest Management techniques (IPM)
- Review results of observation journal; discuss successes and failures
- Arrange for watering during summer months: either automatic, paid, or by volunteers
With a little care during the summer, the school garden can provide many exciting outdoor activities through the fall and winter.

Oklahoma summers are typically hot and dry, so watering is essential. Also remember to find volunteers who want to harvest the fruits and vegetables and locate someone to eat them!

**June**

- Water (irrigation systems make this much easier)
- Weed
- Harvest as crops begin yielding
- Arrange for donation or preservation of harvest
- Control pests with Integrated Pest Management techniques (IPM)

**July**

- Water (irrigation systems make this much easier)
- Weed
- Harvest as crops begin yielding
- Arrange for donation or preservation of harvest

**August**

- Water (irrigation systems make this much easier)
- Weed
- Reapply mulch and/or organic fertilizers such as compost if needed
- Continue harvesting crops
- Arrange for use, donation or preservation of harvest
- Plan the fall garden semester: seeds, plants, planting dates
- Create a garden sketch
- Set a time table of planting
- Select and purchase plant varieties from seed catalogs or from local farmers
- Start observation journal to measure temperature, weather, planting of seeds or transplants, outbreaks of insects and control applied, and harvesting of crops
- Plant fall and winter seeds and cold-hardy transplants

See “Summer in the School Garden” in the Curriculum Resources for more tips on working with volunteers to maintain the summer garden.
Growing organically means helping plants and beneficial insects thrive together as an integrated ecosystem. Organic gardeners focus on promoting the health of the soil and providing the right environment for plants (water, mulch, compost) to decrease the likelihood of disease and pest infestations, while protecting the beneficial insects like pollinators and butterflies that are needed for the garden to thrive.

**Start with the Soil**

- Add generous amounts of compost each year
- Mulch around plantings with straw, shredded leaves or other organic matter
- Plant cover crops in winter
- Avoid synthetic fertilizers

**Prevention is key**

- Each plant has different requirements; try to provide the best conditions for their needs (pH, temperature, moisture and sunlight)
- Rotate plantings around the garden to prevent build-up of disease organisms in the soil
- Select disease-resistant and pest-resistant plant varieties

**Welcome garden allies**

Most insects are beneficial to the garden! Many of them pollinate plants or actually prey on pest insects, while microorganisms are needed to help create and build healthy soil. To be a safe haven for these beneficial organisms:

- Avoid chemical pesticides
- Avoid chemical herbicides

- Rely on natural fertilizers that feed earthworms and microbes
- Purchase organic or non-treated plants and seeds to avoid plants that have been treated with neonicotinoid chemical pesticides—which are toxic to bees and other insects. (Find sources for organic plants on page 14.)
- Include flowers, herbs and shrubs in and around the garden to serve as food plants and host sites for beneficial insects.
Many curriculum resources are available to help you teach science, math, and other subjects using your school garden. Here are just a few:

The Collective School Garden Network Curriculum – [www.csgn.org](http://www.csgn.org)

How-to Guides and Teacher Links - [http://www.kidsgardening.org/school-gardening](http://www.kidsgardening.org/school-gardening)

Classroom Projects in the School Garden - [http://www.kidsgardening.org/classroom-projects](http://www.kidsgardening.org/classroom-projects)


[www.LifeLab.org](http://www.LifeLab.org) – resources for both paid and free downloadable lessons (1 – 4 Science Exploration units)


Kitchen Lessons from Edible Schoolyards — [http://edibleschoolyard.org/esyberkeley#curriculum](http://edibleschoolyard.org/esyberkeley#curriculum)


You don’t have to have a specific curriculum to get outside! Just push the EASY button and take advantage of the opportunity to use the garden as a:

- Writing prompt,
- Location for observation and drawing, or
- Place to measure and record all kinds of data

**Geography**

- Construct map of garden
- Compare map of garden to actual garden
- Discuss garden and food plants that thrive in different types of climates (arid, frigid, temperate, tropical)
- Use the garden to discuss interaction of temperature, climate, weather, and soil
- Discuss the dispersion of food crops with human migration

**Social Studies**

- Relate legends and myths to the garden
- Identify and discuss ways that agriculture has influenced history
- Describe different ways of growing food (agriculture, pastoralism, etc.)
- Highlight crops that have influenced human history
- Grow, harvest and sample food crops from different cultures
- Consider how inventions and technology have influenced gardening practices
- Use the garden to illustrate economic concepts
This example illustrates a few of the fun ways that teachers and students can use the garden space for interactive, immersive mathematical learning.

<table>
<thead>
<tr>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Grade 3</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Grade 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Measure the garden</td>
<td>• Measure the school garden with various standard and non-standard units</td>
<td>• Measure the school garden in metric units</td>
<td>• Measure perimeter and area of the garden</td>
<td>• Create a map to scale of the garden</td>
<td>• Calculate volume of soil in a plant bed</td>
<td>• Solve word and story problems related to the garden</td>
<td>• Measure and calculate area, perimeter, surface area, and volume of soil in the garden</td>
</tr>
<tr>
<td>• Identify various shapes in the garden</td>
<td>• Identify two and three dimensional shapes in the garden</td>
<td>• Divide garden beds to understand simple fractions</td>
<td>• Measure and compare air and soil temperature</td>
<td>• Use garden measurements to demonstrate fractions and percentages</td>
<td>• Create graphs to illustrate data from plant studies</td>
<td>• Identify geometric shapes and concepts</td>
<td>• Create graphs to show data collected from experiments in the garden</td>
</tr>
<tr>
<td>• Record daily temperature on a chart in the classroom</td>
<td>• Collect, record and graph daily temperature</td>
<td>• Divide garden beds into fractional units</td>
<td>• Calculate number of seeds, seed packets, and plants to purchase for the garden</td>
<td>• Recognize patterns in the garden</td>
<td>• Calculate cost of seeds, plants, and materials needed for the garden</td>
<td>• Create a garden budget for the semester</td>
<td>• Create budget proposal for additional garden beds</td>
</tr>
</tbody>
</table>
This example illustrates just a few of the engaging ways that teachers and students can use the garden space for interactive, immersive scientific exploration.

**Kindergarten**
- Observe organisms in their environment
- Describe organisms (plants, insects)
- Draw organisms in their environment

**Grade 1**
- Observe lifecycle of various plants
- Describe differences and similarities between organisms (plants, insects)
- Observe and describe requirements for survival of living organisms

**Grade 2**
- Observe, investigate, describe different types of soils
- Observe and compare seedling growth in different garden areas (sun/shade)
- Harvest fruits and vegetables, dissect and examine the various parts

**Grade 3**
- Observe and describe pollination process
- Discuss importance of pollination to food supply
- Draw and label organisms and their parts (vegetable plants, trees, insects)

**Grade 4**
- Construct compost pile and measure various aspects of decomposition over time
- Collect and examine organisms from compost pile using microscope

**Grade 5**
- Observe, record weather-related data and describe patterns of weather over time
- Conduct experiments to examine how soil is affected by weather, rainfall, plant growth, and decomposition

**Grade 6**
- Describe differences and similarities between animal and plant kingdoms
- Collect and examine soil samples
- Analyze and compare structure and reproductive strategies of different plants

**Grade 7**
- Examine and describe function of organisms from different kingdoms in the garden environment
- Observe and describe interactions between living organisms; for example predator/prey, producer/consumer, parasite/host
FURTHER RESOURCES

Oklahoma City Resources

**OKC Harvest**—okchrchavest.org—This hands-on school garden program provides on-site garden facilitation, education and planting using sustainable and environmentally sound gardening practices (garden builds and workshops); also available to help teachers develop lessons.

**OSU Extension Gardening Fact Sheets**—http://pods.dasnr.okstate.edu/docushare/dsweb/View/Collection-398

**OSU Master Gardeners**—Ask questions about gardening and plants! 405-713-1125; M-F 8:00—4:30 pm

**Oklahoma Food Coop**—oklahomafood.coop—Find flower plants not treated with bee-toxic neonicotinoids with providers Renricks and Skyridge Farms

**OSU-OKC Farmer’s Market, 400 N. Portland Ave. OKC**
Wed/Sat 8-12 (summer) — Find fruit, vegetable and flower plants not treated with bee-toxic neonicotinoids

**CommonWealth Urban Farms**— An active teaching and touring urban farm in NW OKC—commonwealthurbanfarms.com

Gardening

**Texas Organic Vegetable Gardening** by J. Howard Garrett and C. Malcolm Beck

**How to Grow More Vegetables**, John Jeavons

**Four Season Harvest**, Elliot Coleman

**Edible Landscaping**

**Oklahoma Gardener’s Guide**, Steve Dobbs

**Great Garden Companions**, Sally Cunningham

**Permaculture**

**Permaculture in a Nutshell**, Patrick Whitefield

**Gaia’s Garden**, Toby Hemenway

**Seed Sources**

Southern Exposure Seed Exchange

Baker Creek Rare Seeds

**Cooking Vegetables**

**Simply in Season** Cookbook

Allrecipes.com

ACKNOWLEDGEMENTS

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We would also like to credit the “Make the Case Guide” from School Garden Wizard for providing curriculum suggestions that we have adapted, and Robert and Barbara Stelle at Sunrise Acres (http://sunriseacres.mypldi.net) for providing the Fall and Spring Planting Guides found in Appendix A.
## APPENDIX A: SPRING PLANTING GUIDE

### COURTESY OF SUNRISE ACRES

**COOL CROPS** can stand a frost

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>When to Plant</th>
<th>Seed or Plant</th>
<th>Depth to Plant</th>
<th>Between Plants</th>
<th>Between Rows</th>
<th>Feet</th>
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<tbody>
<tr>
<td>ASPARAGUS</td>
<td>Feb 15 - Mar 31</td>
<td>Roots</td>
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<td>CABBAGE</td>
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**WARM CROPS** cannot stand a frost

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>When to Plant</th>
<th>Seed or Plant</th>
<th>Depth to Plant</th>
<th>Between Plants</th>
<th>Between Rows</th>
<th>Feet</th>
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<td>GREEN BEAN (Bush)</td>
<td>Mar 15 - May 31</td>
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<td>SQUASH (Winter)</td>
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<td>WATERMELON</td>
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WARM CROPS cannot stand a frost

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COOL CROPS can stand a frost

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<th>Seed or Plant</th>
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