



## Teacher Guide: 3<sup>rd</sup> Grade

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California Education Standards – 3<sup>rd</sup> Grade

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## Gecko Garden: Rethinking Curriculum Integration

Today's students are hungry for work that is real, for learning that is meaningful.<sup>1</sup> Many teachers use projects to connect learning in a variety of subject areas and most children are excited to make these leaps of understanding. This strategy allows students to take more responsibility for their learning as they make decisions and create solutions to problems that interest them. In fact, with a little imagination, all subjects can be integrated as students apply their academic, social and life skills to their work in a garden.<sup>1</sup> By adopting a project-based learning strategy, garden work will not compete with our standards; rather it will be an avenue to high standards.<sup>2</sup>

Moreover, in this age of global warming, population explosion, and declining natural resources, it is more important than ever that our children learn to be better stewards of our environment. Working in a garden helps children develop an appreciation for our environment and the precious resources it provides.

The reasons in the literature are numerous for supporting garden use and incorporating project based learning, the unique situation facing Grant with the expansion to K-8 offers several more. The joining of garden projects with a Farmers market can offer appropriate challenges to all students. It can give older students, with years of practical experience, a venue and meaningful way to foster younger students. And like no other event at Grant, it can unite all members of the school behind a showcase educational project that teachers, parents and especially students will be proud of. That said, some practical steps are required to reap the many benefits of this garden project:

1. Build upon Grant's tradition of learning in the Gecko Garden and create a school-wide garden project that could culminate in a student run Farmers Market.
2. Give students full responsibility for the garden and the market. The students should decide: what to plant and when, how to amend the soil, how to procure supplies, and how to price and market the garden produce and so on. These are all decisions we are teaching them to make with the skills they are learning in math, science, social studies and reading.
3. Utilize garden volunteers to develop and/or assist teachers in creating lesson plans to support each activity in the garden and market.
4. Foster participation from all the students and teachers at Grant through grade-appropriate activities including garden maintenance, planting and sales;

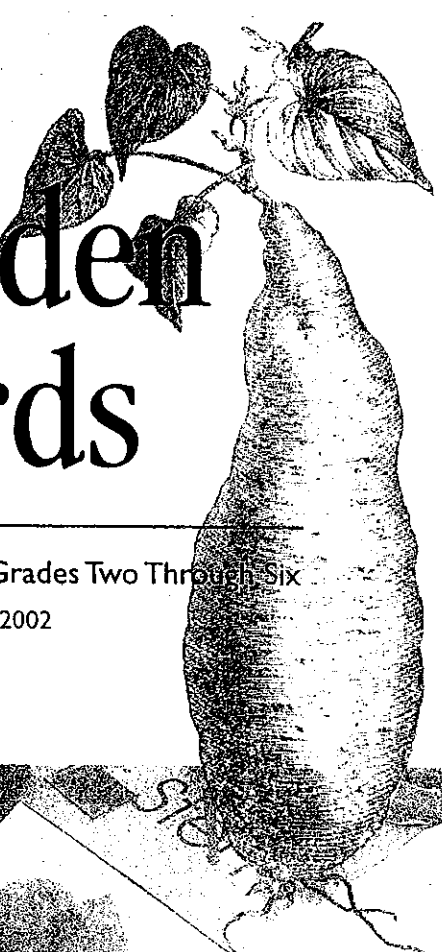
1) Rethinking Curriculum Integration, [www.ecoliteracy.org](http://www.ecoliteracy.org) (An education think-tank)

2) Childs Garden of Standards. Linking School Gardens to California Education Standards, California Department of Education, 2002. Delaine Easton, Superintendent of Public Instruction





# A Child's Garden of Standards



Linking School Gardens to California Education Standards • Grades Two Through Six

California Department of Education • Sacramento, 2002



The main purpose of *A Child's Garden of Standards* is to demonstrate that garden-based education (GBE) strongly supports and enhances California's academic content standards. Most of the suggested activities in this guide come from 11 GBE instructional materials. The tables for grades two through six are the heart of the document. They provide an easy way for educators to identify grade-appropriate, garden-based activities in each core subject area and help educators focus their programs on one or more of the seed-to-table content areas: gardening, nutrition, cooking, waste management, and agricultural systems.

### Intended Audience

The guide was written with several audiences in mind. First, it is for teachers with interest and enthusiasm but little or no experience in garden-based activities. Second, it is for teachers who currently use gardens and are looking for new ideas and resources. Third, it is for school administrators, such as superintendents, principals, and school board members, who want to gain a general understanding of how a school garden fits into their educational goals. And finally, it is for the countless volunteers and nonteacher professionals, such as families,



**Table 1 The Instructional Materials Used in the Guide**

Instructional Material	Publisher	Suggested Grade Levels	Seed-to-table Content Area	Brief Description
<i>Simple and Complex Machines Used in Agriculture</i>	California Foundation for Agriculture in the Classroom (CFAITC) 2300 River Plaza Dr. Sacramento, CA 95833 800-700-2482 <a href="http://www.cfaite.org">www.cfaite.org</a>	2-5	Agricultural systems	These lessons are three of the many lessons available from CFAITC. All lessons are available on its Web site and can be downloaded individually. Lessons cover a broad range of agricultural topics, including insects, genetics, farm machinery, and edible plant parts. CFAITC provides teacher training, crop information sheets, a newsletter, and a teacher resource guide.
<i>Fruits and Vegetables for Health</i>		4-6	Nutrition Agricultural systems	
<i>What's Bugging You?</i>		4-6	Gardening Agricultural systems	
<i>Closing the Loop</i> (2000)	California Integrated Waste Management (CIWMB) Accounting Unit P.O. Box 4025 Sacramento, CA 95812 916-341-6769 <a href="http://www.ciwmb.ca.gov">www.ciwmb.ca.gov</a>	K-6	Waste management	Fifty lessons are organized into two modules: K-3 and 4-6. The activities introduce students to integrated waste management. Units cover nutrient cycles, resource conservation, and waste reduction, including composting and vermicomposting. CIWMB provides teacher training.
<i>The Growing Classroom</i> (1990)	Life Lab 1156 High Street Santa Cruz, CA 95064 831-459-2001 <a href="http://www.lifelab.org">www.lifelab.org</a>	2-6	Gardening Waste management Agricultural systems	The guide includes over 70 hands-on garden activities. However, the nutrition lessons and case studies are out of date. Life Lab provides teacher training.
<i>Junior Master Gardener, Level One, Teacher /Leader Guide</i> (1999)	Junior Master Gardener (JMG) Program JMG Kids 4066 State Highway 6 South College Station, TX 77845 888-564-5437 <a href="http://www.jmgkids.com">www.jmgkids.com</a>	3-5	Gardening Nutrition Cooking Waste management Agricultural systems	These 4-H youth gardening materials are designed for the regular classroom or after-school programs. Topics include soil and water, ecology/environment, horticulture, insects and diseases, landscape design, fruits, nuts, vegetables and herbs, life skills, and career explorations. Lessons are designed to support Texas Essential Knowledge and Skills. JMG provides teacher training in California with a focus on the California academic content standards.
<i>Kids Cook Farm-Fresh Food</i> (2002)	California Department of Education CDE Press P.O. Box 271 Sacramento, CA 95812 800-995-4099 <a href="http://www.cde.ca.gov/cdepress">www.cde.ca.gov/cdepress</a>	2-6	Gardening Cooking Agricultural systems	Organized by season, the publication has 18 chapters. Each chapter focuses on one crop and provides a crop description, a profile of a farmer, an activity, and recipes. The emphasis is on small California farms and sustainable agriculture. Recipes are designed around seasonal, fresh foods.
<i>Nutrition to Grow On</i> (2001)	California Department of Education CDE Press P.O. Box 271 Sacramento, CA 95812 800-995-4099 <a href="http://www.cde.ca.gov/cdepress">www.cde.ca.gov/cdepress</a>	4-6	Gardening Nutrition Cooking Waste management	Nine nutrition lessons are each integrated with a corresponding garden activity. Lessons focus on the Food Guide Pyramid, nutrients needed for life, portion size, exercise, personal goal settings, and advertising.

*Continued on next page*

**Table I (Continued)**

<b>Instructional Material</b>	<b>Publisher</b>	<b>Suggested Grade Levels</b>	<b>Seed-to-table Content Area</b>	<b>Brief Description</b>
<i>Project Food, Land &amp; People: Resources for Learning</i> (2000)	Project Food, Land & People Presidio of San Francisco P.O. Box 29474 San Francisco, CA 94129 <a href="http://www.foodlandpeople.org">www.foodlandpeople.org</a>	K-12	Gardening Nutrition Cooking Waste management Agricultural systems	These 55 lessons are designed to show the interdependence of agriculture, the environment, and human needs. Topics include growing seedlings, nutrition, health, seasonal celebrations, land use, and population growth. Twenty lessons are available in Spanish. The project provides training.
<i>TWIGS Youth Development Program</i> (1997)	University of California Cooperative Extension San Mateo and San Francisco 625 Miramontes St., Suite 200 Half Moon Bay, CA 94019 650-726-9059	K-6	Gardening Nutrition Cooking Waste management	Fifteen basic gardening lessons and 15 cooking/nutrition lessons are designed for use in classroom or after-school programs. The program connects gardening and nutrition to influence children's attitudes and food choices.
<i>Worms Eat Our Garbage: Classroom Activities for a Better Environment</i> (1993)	Flower Press 10332 Shaver Road Kalamazoo, MI 49024 269-327-0108 <a href="http://www.wormwoman.com">www.wormwoman.com</a>	4-8	Gardening Waste management	More than 100 lessons focus on the world of worms, vermicomposting, and beyond the worm bin. Activities address a broad range of math and English-language arts standards.

teaching materials are available for grades seven through twelve, so additional instructional materials need to be developed.

Other excellent instructional materials are available to support GBE but are not included in the grade-level tables. Some go beyond the scope of this document, and others overlap significantly in content with materials that ultimately were included. For instance, there is a large body of environmental education materials, many of which overlap in content with garden-based materials, that are not a part of this guide. (For more information on these materials, visit the Web site <[www.creec.org](http://www.creec.org)>.)

## Grade-Level Tables

This guide is designed to provide the teacher with good, easy-to-implement activities that *strongly* support one or more of the content standards. The intent of the guide is not to use every activity in each material or to find an activity for every standard. For a number of



# Grade Three / Science

**Table 3.1 Activities that support science standards**

NOTE: To view the complete standards, go to <[www.cde.ca.gov/standards/](http://www.cde.ca.gov/standards/)>.

Standards	Content Areas					Instructional materials	Activities	Links to other grade 3 standards
	GARDENING	NUTRITION	COOKING	WASTE MGMT.	AG. SYSTEMS			
1. Energy and matter have multiple forms and can be changed from one form to another. As a basis for understanding this concept:	a. Students know energy comes from the Sun to Earth in the form of light.	•				<i>Junior Master Gardener</i>	"Money Trees," p. 119: Students visit a shaded site and a sunny site around a building on a sunny day to understand that trees influence the amount of solar energy reaching a <del>building</del> <sup>GARDEN</sup> .	SCI 2.a
	b. Students know sources of stored energy take many forms, such as food, fuel, and batteries. <i>Carrots, peas</i>	•				<i>The Growing Classroom</i>	"We've Got Solar Power!" p. 305: Students design and construct simple miniature solar collectors.	
	c. Students know machines and living things convert stored energy to motion and heat.	•				<i>The Growing Classroom</i>	"Burn Out," p. 356: The teacher burns various foods to demonstrate that energy is stored in food and that food provides energy for the body.	SCI 1.c
	e. Students know matter has three forms: solid, liquid, and gas.	•				<i>The Growing Classroom</i>	"Burn Out," p. 356: The teacher burns various foods to demonstrate that energy is stored in food and that food provides energy for the body.	SCI 1.b
	f. Students know evaporation and melting are changes that occur when the objects are heated.	•				An activity was not selected from the instructional materials. A general activity is suggested.	Students look in the garden and identify, where found, a liquid, a solid, and a gas.	
						<i>The Growing Classroom</i>	"Plant Sweat," p. 135: Students conduct an experiment with potted plants to demonstrate transpiration of water.	SCI 5.a, 5.d, 5.e

beets →

Standards	Content Area					Instructional materials	Activities	Links to other grade 3 standards
	GARDENING	NUTRITION	COOKING	WASTE MGMT.	AG. SYSTEMS			
2. Light has a source and travels in a direction. As a basis for understanding this concept:  a. Students know sunlight can be blocked to create shadows.  b. Students know light is reflected from mirrors and other surfaces.	•					<i>Junior Master Gardener</i>	"Money Trees," p. 119: Students visit a shaded site and a sunny site around a building on a sunny day to understand that trees influence the amount of energy reaching a building.	SCI 1.a
	•					<i>The Growing Classroom</i>	"Star Food," p. 143: Students use foil to reflect light onto some of the plants in a garden. They compare the rates of growth between the plants that receive light and those that do not.	SCI 5.c
3. Adaptations in physical structure or behavior may improve an organism's chance for survival. As a basis for understanding this concept:	•					<i>Junior Master Gardener</i>	"Flower Dissection," p. 11: Each student dissects a flower.	SCI 5.e MATH M&G 1.1
	•					<i>The Growing Classroom</i>	"Let's Get a Handle on This," p. 128: Students conduct an experiment with climbing peas to observe the plants' use of tendrils.	
	•					<i>The Growing Classroom</i>	"Adapt a Seed," p. 118: Students use classroom materials to design imaginary seeds to show various dispersal mechanisms, such as floating, attracting animals, and hitchhiking.	
	•					<i>Project Food, Land &amp; People: Resources for Learning</i>	"Investigating Insects," p. 181: Students observe insects in the school environment and identify and label body parts.	
						<i>Closing the Loop</i>	"Getting to Know Red Worms," p. 121: Students study red worms and answer questions about the worms' anatomy.	
							<i>Success</i>	

Key: ELA—English—Language Arts; HSS—History—Social Science; L&S—Listening and Speaking; MATH—Mathematics; M&G—Measurement and Geometry; MR—Mathematical Reasoning; NS—Number Sense; R—Reading; SCI—Science; W—Writing

Table 3.1 Activities that support science standards (Continued)

Standards	Content Areas				Instructional materials	Activities	Links to other grade 3 standards
	GARDENING	NUTRITION	COOKING	WASTE MGMT.	AG. SYSTEMS		
3. Adaptations in physical structure or behavior may improve an organism's chance for survival. As a basis for understanding this concept:	b. Students know examples of diverse life forms in different environments, such as oceans, deserts, tundra, forests, grasslands, and wetlands.					"No Worms Here," p. 34: Students answer questions on environments in which they would find earthworms.	
	c. Students know living things cause changes in the environment in which they live; some of these changes are detrimental to the organism or other organisms, and some are beneficial.					"Power Seeds," p. 16: Students observe the force that seeds exhibit during germination.	SCI 3.a, 5.d
	effect of encasement boxes					"The Great and Powerful Earthworm," p. 279: Students investigate earthworms as soil tillers.	SCI 5.d
						"Natural Defense," p. 249: Students conduct an experiment in weed growth by using leaves from certain plants to demonstrate how a plant can emit natural poisons that inhibit the growth of neighboring plants.	
						"Rotation," p. 37: Students play a simulation game demonstrating the use of nutrients by different plants and the need for crop rotation.	SCI 3.d
						"The Effects Worms Have on Soil," p. 143: Students examine worm castings and discuss how the activities of worms affect soil.	
						"Rotation," p. 37: Students play a simulation game demonstrating the use of nutrients by different plants and the need for crop rotation.	SCI 3.c
	d. Students know when the environment changes, some plants and animals survive and reproduce; others die or move to new locations.					"Warm/Cold Adaptation," p. 26: Students answer questions about how worms respond to variations in temperature.	ELA R 2.3

Standards	Content areas				Instructional materials	Activities	Links to other grade 3 standards
	GARDENING	NUTRITION	COOKING	WASTE MGMT.			
Life Sciences					<i>The Growing Classroom</i>	"To Dig or Not to Dig," p. 81: Students study the effects of soil compaction on plant growth.	SCI 5.c, 5.d, 5.e
Earth Sciences	4. Objects in the sky move in regular and predictable patterns. As a basis for understanding this concept:	e. Students know the position of the Sun in the sky changes during the course of the day and from season to season.			<i>Junior Master Gardener</i>	"The Zones," p. 152: Students study a climate map, locating their community and identifying appropriate plants for the different zones. They then go outside to note the position of the sun in the sky during the day in relation to north, south, east, and west. <i>Sun Study Fall/Winter/Spring</i>	SCI 3.b HSS 3.1.2
Investigation and Experimentation	5. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:	a. Repeat observations to improve accuracy and know that the results of similar scientific investigations seldom turn out exactly the same because of differences in the things being investigated, methods being used, or uncertainty in the observation.			<i>The Growing Classroom</i>	"Plant Sweat," p. 135: Students conduct an experiment with potted plants to demonstrate transpiration of water.	SCI 1.f, 5.d, 5.e

Key: ELA—English—Language Arts; HSS—History—Social Science; L&S—Listening and Speaking; MATH—Mathematics; M&G—Measurement and Geometry; MR—Mathematical Reasoning; NS—Number Sense; R—Reading; SCI—Science; W—Writing

Table 3.1 Activities that support science standards (Continued)

Standards	Content areas					Instructional materials	Activities	Links to other grade 3 standards
	GARDENING	NUTRITION	COOKING	WASTE MGMT.	AG. SYSTEMS			
5. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:	b. Differentiate evidence from opinion and know that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed.	•				<i>Junior Master Gardener</i>  <i>Junior Master Gardener</i>  <i>Worms Eat Our Garbage</i>  <i>The Growing Classroom</i>	"What's Not the Same," p. 12: Students test the influence of light on plant growth.  "More Mulch, More Moist," p. 136: Students evaluate how the use of mulch affects water conservation.  "Is That a Fact?" p. 50: Students differentiate fact from opinion.  "Sugar Factories," p. 132: The teacher reads a short story to the class about a historical science experiment that examined how plants grow. Students discuss the opinions of other scientists who performed similar experiments and answer questions about the conclusions of the experiment described in the story.	SCI 5.d, 5.e  SCI 5.c, 5.e MATH M&G 1.1  ELA L&S 1.1, 1.3
	c. Use numerical data in describing and comparing objects, events, and measurements.	•				<i>Junior Master Gardener</i>  <i>Project Food, Land &amp; People: Resources for Learning</i>  <i>The Growing Classroom</i>	"More Mulch, More Moist," p. 136: Students evaluate how the use of mulch affects water conservation.  "We're into Pumpkins," p. 47: Students measure pumpkins in different ways and investigate their origin.  "What Good Is Compost?" p. 91: Students grow two identical crops, one in a bed with compost and one in a bed without compost. They take data on the rate at which either growth or germination occurs.	SCI 5.b, 5.e MATH M&G 1.1  MATH M&G 1.1; MR 2.1  SCI 5.e
		•						

Standards	Content areas					Instructional materials	Activities	Links to other grade 3 standards
	GARDENING	NUTRITION	COOKING	WASTE MGMT.	AG. SYSTEMS			
Investigation and Experimentation	d. Predict the outcome of a simple investigation and compare the result with the prediction.	•				<i>Junior Master Gardener</i> <i>The Growing Classroom</i>	"What's Not the Same," p. 12: Students test the influence of light on plant growth. "Plant Sweat," p. 135: Students conduct an experiment with potted plants to demonstrate transpiration of water. They make predictions and compare their predictions to the result of the experiment.	SCI 5.b, 5.e SCI 1.f, 5.a, 5.e
	e. Collect data in an investigation and analyze those data to develop a logical conclusion.	•				<i>Junior Master Gardener</i> <i>Junior Master Gardener</i> <i>The Growing Classroom</i> <i>The Growing Classroom</i>	"What's Not the Same," p. 12: Students test the influence of light on plant growth. "More Mulch, More Moist," p. 136: Students evaluate how the use of mulch affects water conservation. "Plant Sweat," p. 135: Students conduct an experiment with potted plants to demonstrate transpiration of water. They collect and analyze data. "What Good Is Compost?" p. 91: Students grow two identical crops, one in a bed with compost and one in a bed without compost. They take data on the rate at which either growth or germination occurs.	SCI 5.b, 5.d SCI 5.b, 5.c MATH M&G 1.1 SCI 1.f, 5.a, 5.d SCI 5.c

Key: ELA—English—Language Arts; HSS—History—Social Science; L&S—Listening and Speaking; MATH—Mathematics; M&G—Measurement and Geometry; MR—Mathematical Reasoning; NS—Number Sense; R—Reading; SCI—Science; W—Writing

# Grade Three / Mathematics

**Table 3.3 Activities that support mathematics standards**

Standards		Content areas				Instructional materials	Activities	Links to other grade 3 standards
		GARDENING	NUTRITION	COOKING	WASTE MGMT.	AG. SYSTEMS		
Number Sense	3.0 Students understand the relationship between whole numbers, simple fractions, and decimals:	3.2 Add and subtract simple fractions (e.g., determine that $\frac{1}{8} + \frac{3}{8}$ is the same as $\frac{1}{2}$ ).		•		<i>Junior Master Gardener</i>	"Garden Veggie Casserole," p. 178: Students bake a casserole with vegetables and answer questions about fractions of teaspoons and tablespoons.	
	1.0 Students select appropriate symbols, operations, and properties to represent, describe, simplify, and solve simple number relationships:	1.4 Express simple unit conversions in symbolic form (e.g., ___ inches = ___ feet $\times$ 12).			•	<i>Junior Master Gardener</i>	"A Bushel and a Peck," p. 144: Students are introduced to units of volume used in the food system and are asked to convert between them.	
Measurement and Geometry	1.0 Students choose and use appropriate units and measurement tools to quantify the properties of objects:	1.1 Choose the appropriate tools and units (metric and U.S.) and estimate and measure the length, liquid volume, and weight/mass of given objects.	•	•		<i>Kids Cook Farm-Fresh Food</i>  <i>Junior Master Gardener</i>  <i>Junior Master Gardener</i>	Recipes: The teacher selects a crop that reflects local agricultural production. Students then follow a recipe for that crop.  "Site Map," p. 121: Students use mathematics skills to generate a landscape design.  "More Mulch, More Moist," p. 136: Students evaluate how the use of mulch affects water conservation.	ELA R 2.7   SCI 5.b, 5.c, 5.e

NOTE: To view the complete standards, go to <[www.cde.ca.gov/standards/](http://www.cde.ca.gov/standards/)>.

Standards	Content Areas				Instructional materials	Activities	Links to other grade 3 standards
	GARDENING	NUTRITION	COOKING	WASTE MGMT.			
1.2 Estimate or determine the area and volume of solid figures by covering them with squares or by counting the number of cubes that would fill them.	•				<i>Junior Master Gardener</i>  <i>Worms Eat Our Garbage</i>	"Small and Large," p. 160: Students measure the garden area and determine appropriate spacing for seeds.  "How Big a Bin?" p. 70: Students determine the volume of various shapes of worm bins and answer questions about appropriately sized bins.	MATH M&G 1.3



# Lesson 1: Welcome & Soil Prep

## Materials:

- Teacher and student workbooks
- Pencils, regular and color
- Shovels, tool cart
- Compost and worm castings

## Plan:

- Welcome students to the garden.
- Discuss Rules, Black Widows and Garden Time.
- Explain the garden plan for the year: crop 1: beets (fall), crop 2: lettuce (spring)
- Review soil components from 2<sup>nd</sup> grade. Discuss amendments that will be added: (worm castings and compost).

## Explain Group Activities.

### Garden Group

- Add compost and worm castings to the soil and turn

### Table group:

- Decorate workbook
- First Journal entry

Optional Activity: Students in 3<sup>rd</sup> grade study the sun, its' position in the sky and shadows. The garden is a great place to observe this.

Students can monitor the sun's position in the sky through the different seasons by standing in a fixed position (back against the wall) and measuring its distance above a fixed object with their arm extended. If they record this in their journal with each visit they will see how it changes. They can also look at the shadows cast across the beds.

Divide into groups and switch after approximately 10 minutes.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

# Garden Time

**1 Sit**

**2 Listen**

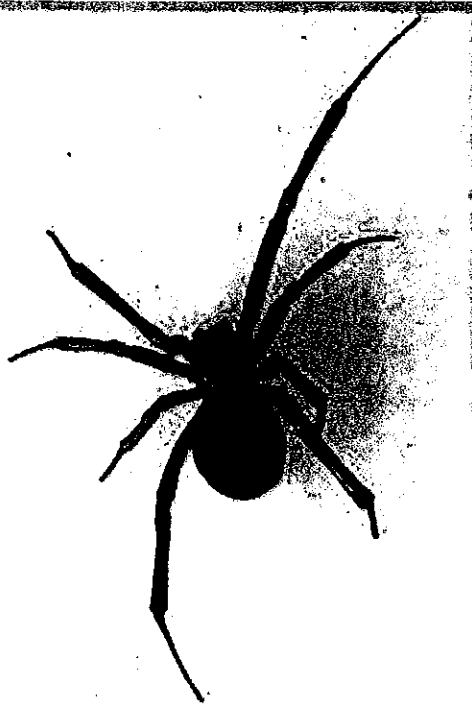
**3 Groups**

**4 Switch groups**

**5 Cleanup**

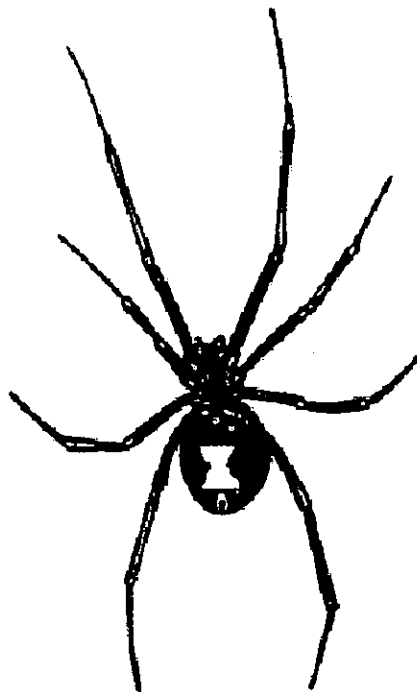
# Black Widow Spider

Back  
(dorsal)



\_\_\_\_\_ legs

Front  
(ventral)



## Lesson 2: Planting Beets

### Materials:

- Teacher and student workbooks
- Pencils, regular and color
- Beet seeds

### Plan:

If soil is very dry, thoroughly moisten with hose prior to planting. Students may need to turn the soil as you spray it. (When it is dry for an extended period and under the Eucalyptus trees, it tends to repel the water. Turning helps water soak in.) Spread out drip line and secure in place. Plant seeds along drip line.

Using a ruler, show the students how deep to plant the seeds by measuring the distance on their finger. Have them poke the seed down to the correct depth.

Make sure the water valve at the bed is turned on.

Cover bed with netting to help keep squirrels out.

### Explain Group Activities.

#### Garden Group

Follow seed packet information when plantings seeds.

#### Table group:

Entry in garden journal

Optional Activity: Students in 3<sup>rd</sup> grade study the sun and its position in the sky in their science curriculum. To apply this in the garden you can take a moment each visit to have students observe the position of the sun and shadows that are cast on the beds from the trees. When observing the position, have students stand in a fixed position each visit and without looking directly at the sun, observe how high it is above the horizon and relative to other landmarks.

Divide into groups and switch after approximately 10 minutes.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

## Define It

**Define:** \_\_\_\_\_

**Why is it important?**

**Define:** \_\_\_\_\_

**Why is it important?**

## Lesson 3: Observe and Thin

### Materials:

- Teacher and student workbooks
- Pencils, regular
- Rulers
- Seed Packet

### Plan:

Beets seeds are actually a cluster of several seeds so it is necessary to remove all but one. This can be tricky because when you pull one, sometimes it pulls them all out. Challenge the students to be “beet surgeons” and remove just one at a time. If this proves too difficult, it may be easier to trim the top off the unwanted seedlings. Use rulers to measure appropriate spacing.

### Explain Group Activities.

#### Garden Group

- Thin beets
- Look for signs of pest.
- Add more seeds if seedlings are very sparse.

#### Table group:

- Entry in garden journal
- Optional: Observe the position of the sun in the sky.

Divide into groups and switch after approximately 10 minutes.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

## Lesson 4: Harvest Beets and Soil Prep.

### Materials:

- Teacher and student workbooks
- Pencils, regular
- 3 buckets of water
- Storage containers for beets

### Plan:

If beets are ready, 1-3" diameter, plan to harvest. Have each student pull one at a time. Wash through a series of 3 buckets (like they did with carrots in 1<sup>st</sup> grade). Depending on what the class plans to do with the beets will dictate if you leave the greens on or cut them off. Beet greens are delicious to eat.

- 1) Store under appropriate conditions until Farmers' Market
- 2) Prepare and eat
- 3) Pickle
- 4) Sell in the morning before school – not waiting until market.
- 5) Combination of these depending on yield.

### Explain Group Activities.

#### Garden Group

Harvest beets

(Turn off water with valve at bed until lettuce is planted)

#### Table group:

Journal entry

Divide into groups and switch after approximately 10 minutes.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

# Adaptation & Succulents

**Standards: 3a, b, d**

Succulent plants, ~~also known as succulents or fat plants~~, are water-retaining plants adapted to arid climate or soil conditions. Succulent plants store water in their leaves, stems and/or roots. The storage of water often gives succulent plants a more swollen or fleshy appearance than other plants, also known as succulence. In addition to succulence, succulent plants variously have other water-saving features. These may include:

- Absent, reduced, or cylindrical to spherical leaves
- reduction in the number of stomata
- stems, rather than leaves, as the main site of photosynthesis
- a compact, reduced, cushion-like, columnar or spherical growth form
- ribs enabling rapid increases in plant volume and decreasing surface area exposed to the sun
- waxy, hairy or spiny outer surface to reduce water loss via the creation of a humid microhabitat around the plant and a reduction in air movement near the surface of the plant.
- CAM metabolism to minimize water loss

Many succulents come from the dry areas of the tropics and subtropics, such as steppes, semi-desert and desert. High temperatures and low precipitation force plants to collect and store water in order to survive long dry periods. Succulents also occur as epiphytes, as such they have limited or no contact with the ground, and are dependent on their ability to store water. Succulents also occur as inhabitants of sea coasts, or salt pans which are exposed to high levels of dissolved minerals.

The best known succulents are cacti (family: Cactaceae). Virtually all cacti are succulents, but many succulents are not cacti.

(Adapted From Wikipedia)

## Activity:

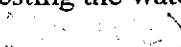
Discuss plant adaptations and modifications.

Tour garden and canyon letting students identify and observe different succulents. Then complete worksheet.

Propagate different succulent plants by taking cuttings (plants and pots to be provided)

Propagated plants can be used for:

- 1) expanding the succulent garden
- 2) sold at student-run Farmers' Market

Optional activity: Perform an experiment testing the water needs of two different plants -- a succulent vs. a water-loving leafy plant. 



# Succulents

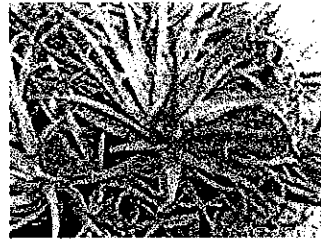
Succulents are a group of plants that have adapted to arid climates. Succulents may have modified leaves, stems or roots that allow them to retain water longer than other plants. Some modifications include:

- Reduced or absent leaves
- Reduction in the number of stomata
- Spherical growth form
- Pleated stems
- Wax like coating on outer surfaces.

Listed below are two examples of plants in the succulent family with modified parts.

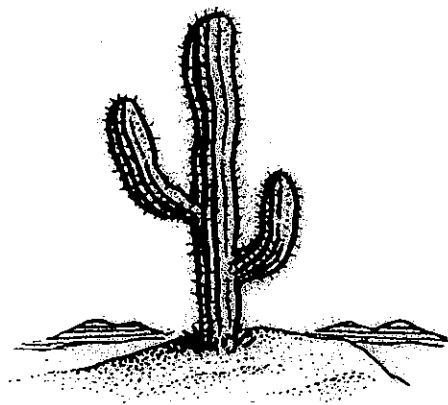
**Aloe:** The waxy surface of the aloe leaf acts like a plastic wrapper, keeping precious water inside.

**Modified Part:** Leaf

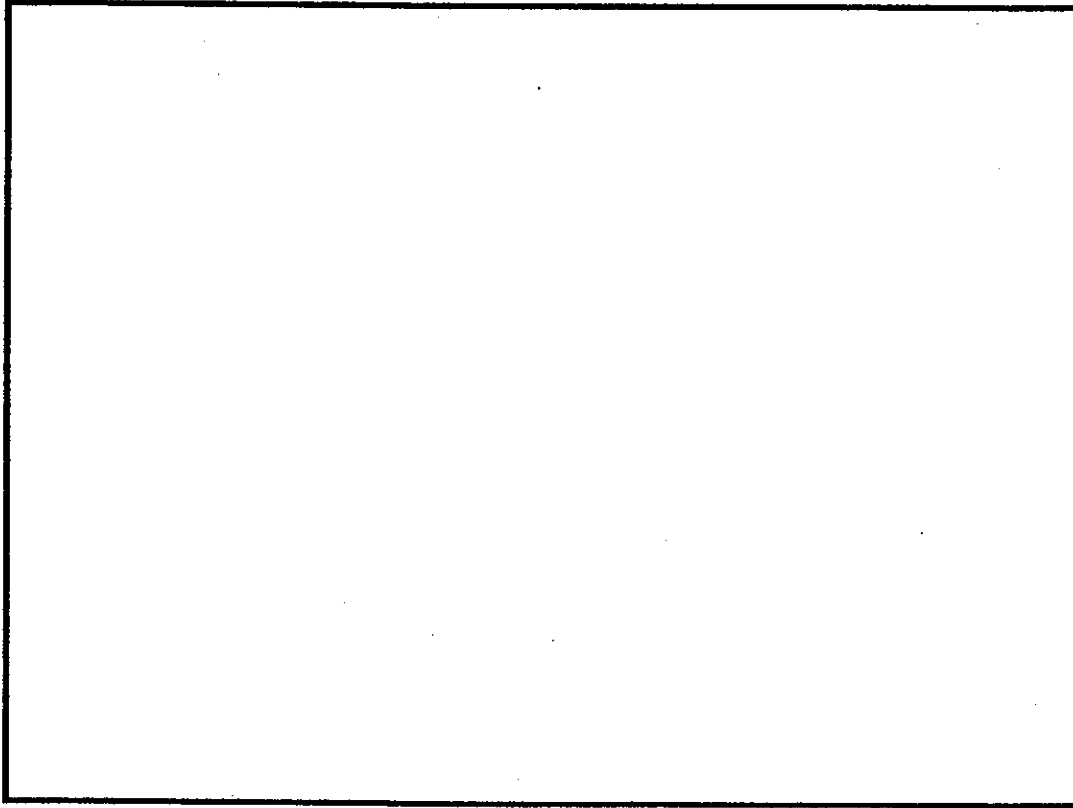


**Saguaro Cactus:** They store water in their green stem. It is spongy on the inside and pleated on the outside so it can expand to hold lots of water until the next rain. They do not have leaves but carry out photosynthesis in the top layer of the stem.

**Modified Part:** Stem



**Draw a picture of a succulent you have seen in the garden.**



**What modifications do you think this plant has that have allowed it to adapt to a dry climate?**

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## Lesson 5: Plant Lettuce

### Materials:

- Teacher and student workbooks
- Pencils, regular and color
- Lettuce seeds

Optional Activity: Discuss adaptation. Compare and contrast lettuce and succulents then observe the different types of succulents in the garden.

### Garden

- Plant lettuce seeds

Note: The lettuce will probably be harvested when it is relatively small so the seeds can be planted fairly close.

### Table group:

- Journal entry
- Optional: Worksheet on succulents.

Optional Activity: Prepare a class poster for the student Farmers' Market or recipes for preparing market items.

### Optional Activity:

Allow students, in pairs, to take one cutting and plant them all in one large pot as a miniature succulent garden. These can be kept in the class, donated or sold at the Farmers' Market.

Divide into groups and switch after approximately 10 minutes.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

## Compare and Contrast: Lettuce and Succulent

<b>Growth Requirements:</b>	<b>Succulent</b>	<b>Lettuce</b>
water		
soil		
sun		
temperature		
<b>Plant Anatomy:</b>		
stem		
roots		
leaf		

Name\_\_\_\_\_

## Find That Veggie!

Vegetable	Bed Number	Part We Eat (circle one)
carrots		root, tuber, bulb, stem, leaf, flower, seeds
peas		root, tuber, bulb, stem, leaf, flower, seeds
potato		root, tuber, bulb, stem, leaf, flower, seeds
lettuce		root, tuber, bulb, stem, leaf, flower, seeds
onions		root, tuber, bulb, stem, leaf, flower, seeds
radish		root, tuber, bulb, stem, leaf, flower, seeds
		root, tuber, bulb, stem, leaf, flower, seeds

## Lesson 6: Observe & Thin

### Materials:

Teacher and student workbooks

Pencils, regular and color

Optional Activity: Discuss adaptation. Compare and contrast lettuce and succulents then observe the different types of succulents in the garden.

### Garden

Observe and thin lettuce plants as necessary

Note: The lettuce will probably be harvested when it is relatively small so plants can be fairly close.

### Table group:

Journal entry

Optional: Worksheet on succulents.

Optional Activity: Prepare a class poster for the student Farmers' Market or recipes for preparing market items.

### Optional Activity:

Allow students, in pairs, to take one cutting and plant them all in one large pot as a miniature succulent garden. These can be kept in the class, donated or sold at the Farmers' Market.

Divide into groups and switch after approximately 10 minutes.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

## **Lesson 7: Harvest Lettuce**

Lettuce should be harvested within 2 days of the market and stored in a refrigerator.

### **Materials:**

- Teacher and student workbooks
- Pencils, regular
- Scissors
- Large Ziploc bags

### **Plan:**

Demonstrate how to carefully harvest lettuce plants. You can either carefully cut off the leaves to preserve the plant and let it keep growing, or you can gently pull up the whole plant and cut off the roots. Store in 1 gallon Ziploc bags and take to a refrigerator immediately or temporarily store in cooler in garden if it is a hot day.

Allow students to sample a few leaves if they wish and/or prepare a class salad bar with their favorite fixings.

If possible, have students weigh their total harvest so we can track this over time.

Record entry in journal.

Save the last 5 minutes to clean up. (Tools, pencils and journals put away)

## Lesson 8: Return to Compost

### Materials:

Teacher and student workbooks

Pencils, regular

Gloves

If there are any remaining plants in the beds that will not be consumed, have the students pull them up and put them in the appropriate compost bin.

Turn off the water to the bed at the blue valve.

Remove any bed covers and supports.

Review the garden season and send journals home with students.