GRANT GECKO GARDEN

PLANT | LEARN | GROW

Teacher Guide: 5th Grade

Grade 5

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,

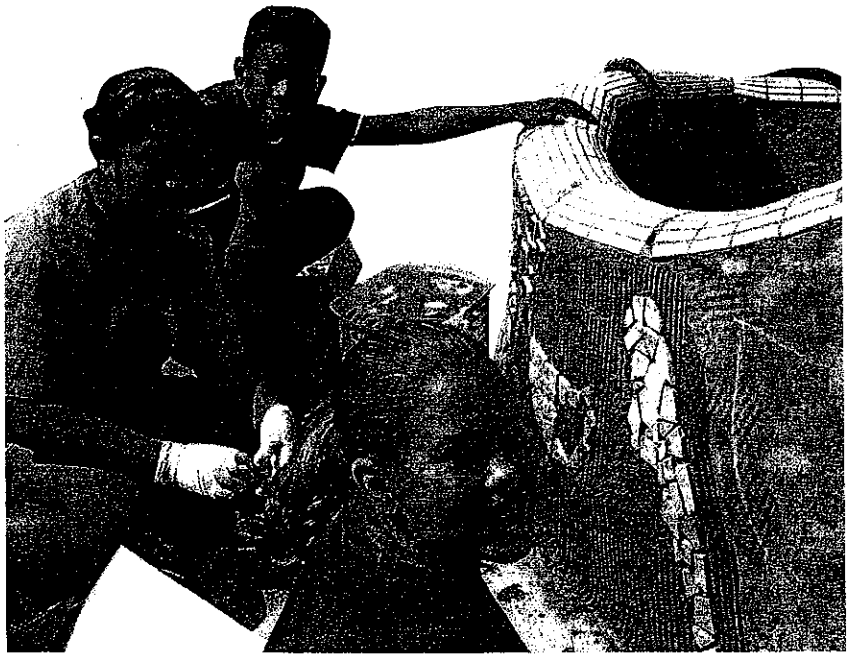


Table 1 The Instructional Materials Used in the Guide

Instructional Material	Publisher	Suggested Grade Levels	Seed-to-table Content Area	Brief Description
Simple and Complex Machines Used in Agriculture *Fruits and Vegetables for Health* *What's Bugging You?*	California Foundation for Agriculture in the Classroom (CFAITC) 2300 River Plaza Dr. Sacramento, CA 95833 800-700-2482 *www.cfaitc.org*	2–5 4–6 4–6	Agricultural systems Nutrition Agricultural systems Gardening 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.
Closing the Loop (2000)	California Integrated Waste Management (CIWMB) Accounting Unit P.O. Box 4025 Sacramento, CA 95812 916-341-6769 *www.ciwmb.ca.gov*	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.
The Growing Classroom (1990)	Life Lab 1156 High Street Santa Cruz, CA 95064 831-459-2001 *www.lifelab.org*	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.
Junior Master Gardener, Level One, Teacher /Leader Guide (1999)	Junior Master Gardener (JMG) Program JMG Kids 4066 State Highway 6 South College Station, TX 77845 888-564-5437 *www.jmgkids.com*	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.
Kids Cook Farm-Fresh Food (2002)	California Department of Education CDE Press P.O. Box 271 Sacramento, CA 95812 800-995-4099 *www.cde.ca.gov/cdepress*	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.
Nutrition to Grow On (2001)	California Department of Education CDE Press P.O. Box 271 Sacramento, CA 95812 800-995-4099 *www.cde.ca.gov/cdepress*	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 1 (Continued)

Instructional Material	Publisher	Suggested Grade Levels	Seed-to-table Content Area	Brief Description
Project Food, Land & People: Resources for Learning (2000)	Project Food, Land & People Presidio of San Francisco P.O. Box 29474 San Francisco, CA 94129 *www.foodlandpeople.org*	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.
TWIGS Youth Development Program (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.
Worms Eat Our Garbage: Classroom Activities for a Better Environment (1993)	Flower Press 10332 Shaver Road Kalamazoo, MI 49024 269-327-0108 *www.wormwoman.com*	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*>.)

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 Five / Science

Table 5.1 Activities that support science standards

NOTE: To view the complete standards, go to <*www.cde.ca.gov/standards/*>.

	Standards		Content areas: Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	Instructional materials	Activities	Links to other grade 5 standards
Physical Sciences	1. Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept:	f. Students know differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.	•					*The Growing Classroom*	"The Nitty-Gritty," p. 73: Students separate soil according to the physical properties of its three major components: sand, silt, and clay. - soil test NPK - Discuss Carbon	SCI 6.a
Life Sciences	2. Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials. As a basis for understanding this concept:	a. Students know many multicellular organisms have specialized structures to support the transport of materials.	•	•	•			*Project Food, Land & People: Resources for Learning*	"Root Root for Life," p. 91: After reading supporting information, students move through stations to observe different types of roots, to learn the ways in which roots help plants, to know the reasons roots are important to people, and to taste the roots.	
			•					*The Growing Classroom*	"Sipping Through a Straw," p. 134: Students observe how colored water moves through a celery stalk.	SCI 2.e
			•					*Project Food, Land & People: Resources for Learning*	"Gifts from the Sun," p. 203: Students read supporting information on photosynthesis and perform skits introducing carbon dioxide, stomata, and other components of photosynthesis.	SCI 2.f, 2.g
				•				*TWIGS*	"Staying Fit with Fiber," p. 105: Students use tubing to simulate an intestine and to compare how foods with varying amounts of fiber move through the model.	

	Standards	Content areas: Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	Instructional materials	Activities	Links to other grade 5 standards
Life Sciences	b. Students know how blood circulates through the heart chambers, lungs, and body and how carbon dioxide (CO_2) and oxygen (O_2) are exchanged in the lungs and tissues.	•			•		*Worms Eat Our Garbage*	"'Breathing' Basics," p. 30: Students answer questions by using a diagram to illustrate the exchange of oxygen and carbon dioxide across membranes.	
	e. Students know how sugar, water, and minerals are transported in a vascular plant.	•					*The Growing Classroom*	"Sipping Through a Straw," p. 134: Students observe how colored water moves through a celery stalk.	SCI 2.a
	f. Students know plants use carbon dioxide (CO_2) and energy from sunlight to build molecules of sugar and release oxygen.	•					*The Growing Classroom*	"Plants Need Light Too," p. 139: Students use cork disks to prevent light and air from reaching a section of a leaf, which they then test for starch content.	
		•					*Project Food, Land & People: Resources for Learning*	"Gifts from the Sun," p. 203: Students read supporting information on photosynthesis and perform skits introducing carbon dioxide, stomata, and other components of photosynthesis.	SCI 2.a, 2.g
		•					*Nutrition to Grow On*	"Introduction to Nutrition and Gardening," p. 9, Gardening Activity: To explore photosynthesis, students grow seedlings, varying the amount of light and water for particular plants. Students record their two- to four-week observations of the plants, compare results to those of a control group, and draw conclusions.	

Key: ELA—English–Language Arts; L&S—Listening and Speaking; MATH—Mathematics; M&G—Measurement and Geometry; MR—Mathematical Reasoning; NS—Number Sense; R—Reading; SCI—Science; STATS—Statistics, Data Analysis, and Probability; W—Writing

Table 5.1 Activities that support science standards (Continued)

	Standards		Content areas: Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	Instructional materials	Activities	Links to other grade 5 standards
Life Sciences	2. Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials. As a basis for understanding this concept:	g. Students know plant and animal cells break down sugar to obtain energy, a process resulting in carbon dioxide (CO_2) and water (respiration).	•					*Project Food, Land & People: Resources for Learning*	"Gifts from the Sun," p. 203: Students read supporting information on photosynthesis and perform skits introducing carbon dioxide, stomata, and other components of photosynthesis.	SCI 2.a, 2.f
Earth Sciences	3. Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept:	a. Students know most of Earth's water is present as salt water in the oceans, which cover most of Earth's surface.					•	*Junior Master Gardener*	"Earth Apple," p. 35: Students divide into sections an apple, which represents the Earth, to illustrate the percentages of land and fresh and salt water.	SCI 3.d MATH NS 1.2
		b. Students know when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.	•				•	*Junior Master Gardener*	"Cloud Maker," p. 36: To simulate the formation of rain, students hold a pan of ice over an empty bowl and observe condensation (rain) on the bottom of the pan.	SCI 3.c
		c. Students know water vapor in the air moves from one place to another and can form fog or clouds, which are tiny droplets of water or ice, and can fall to Earth as rain, hail, sleet, or snow.	•				•	*Junior Master Gardener*	"Cloud Maker," p. 36: To simulate the formation of rain, students hold a pan of ice over an empty bowl and observe condensation (rain) on the bottom of the pan.	SCI 3.b

	Standards		Content areas: Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	Instructional materials	Activities	Links to other grade 5 standards
Earth Sciences		d. Students know that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.					•	*Junior Master Gardener*	"Earth Apple," p. 35: Students divide into sections an apple, which represents the Earth, to illustrate the percentages of land and fresh and salt water.	SCI 3.a MATH NS 1.2
							•	*Project Food, Land & People: Resources for Learning*	"Don't Use It All Up!" p. 57: Students drop sponges into a container of water to represent different human demands on available fresh water. They note the drop in water level and then determine ways to conserve water by wringing water from the sponges back into the container and noting the new level of water.	
		e. Students know the origin of the water used by their local communities.	•				•	An activity was not selected from the instructional materials. A general activity is suggested.	Students trace the water in their garden from the hose nozzle to its source. They follow up this investigation with a field trip to the local water utility.	
							•		Students trace the source of water used by local farmers.	
	4. Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns. As a basis for understanding this concept:	b. Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.					•	An activity was not selected from the instructional materials. A general activity is suggested.	Students study the influence of coastal climate on agricultural production in different parts of the state.	

Key: ELA—English–Language Arts; L&S—Listening and Speaking; MATH—Mathematics; M&G—Measurement and Geometry; MR—Mathematical Reasoning; NS—Number Sense; R—Reading; SCI—Science; STATS—Statistics, Data Analysis, and Probability; W—Writing

Table 5.1 Activities that support science standards (Continued)

Standards		Content areas: Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	Instructional materials	Activities	Links to other grade 5 standards
Investigation and Experimentation									
6. 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. Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.	•					*Junior Master Gardener*	"Shake, Rattle and Roll," p. 26: Students identify the layers of soil texture, graph the height of layers of particles, and from this graph classify the soil texture.	SCI 1.f MATH A&F 1.1; STATS 1.2
		•					*Junior Master Gardener*	"All in the Family: Insect Flash Cards," p. 80: Students make flash cards to learn the orders of insects by characteristics and Venn diagrams.	
		•					*Junior Master Gardener*	"Ordering Insects," p. 81: Students learn to sort insects by similarities and differences.	
		•					*The Growing Classroom*	"The Nitty-Gritty," p. 73: Students separate soil according to the physical properties of its three main components: sand, silt, and clay.	SCI 1.f
		•			•		*Worms Eat Our Garbage*	"Once a Worm, Always a Worm," p. 13: Students use reference books as their guide to classify worms and insect larva.	
					•		*Worms Eat Our Garbage*	"Classes of Worms," p. 120: Students classify worms according to their habitats and burrowing habits.	
	c. Plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out the procedure.	•					An activity was not selected from the instructional materials. A general activity is suggested.	Students develop a simple investigation to test the relationship between plant growth and environmental factors, such as light and moisture.	SCI 6.e, 6.i

Standards		Content areas: Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	Instructional materials	Activities	Links to other grade 5 standards
Investigation and Experimentation	d. Identify the dependent and controlled variables in an investigation.	•					*The Growing Classroom*	"Water We Doing?" p. 164: Students observe the relationship between watering and plant growth after discussing the controlled variables.	
	e. Identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.	•					An activity was not selected from the instructional materials. A general activity is suggested.	Students develop a simple investigation to test the relationship between plant growth and environmental factors, such as light and moisture.	SCI 6.c, 6.i
	g. Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.	•			•	•	*Kids Cook Farm-Fresh Food*	"Making Compost 'Tea,'" p. 78: Students make compost "tea," a preparation used to improve the soil. They conduct an experiment to determine the effects of adding compost tea to plants. They collect and display the data.	MATH STATS 1.2
	h. Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.		•				*Fruits and Vegetables for Health*	"The Chemistry of Fruits and Vegetables," p. 37: Students experiment with fruits and vegetables on how best to store cut produce. They record the results and then discuss and write their conclusions.	SCI 6.i
	i. Write a report of an investigation that includes conducting tests, collecting data or examining evidence, and drawing conclusions		•				*Fruits and Vegetables for Health*	"The Chemistry of Fruits and Vegetables," p. 37: Students experiment with fruits and vegetables on how best to store cut produce. They record the results and then discuss and write their conclusions.	SCI 6.h

Key: ELA—English–Language Arts; L&S—Listening and Speaking; MATH—Mathematics; M&G—Measurement and Geometry; MR—Mathematical Reasoning; NS—Number Sense; R—Reading; SCI—Science; STATS—Statistics, Data Analysis, and Probability; W—Writing

Grade Five / Mathematics

Table 5.3 Activities that support mathematics standards

NOTE: To view the complete standards, go to <*www.cde.ca.gov/standards/*>.		Content areas							
Standards		Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	**Instructional materials**	**Activities**	**Links to other grade 5 standards**
Number Sense	1.0 Students compute with very large and very small numbers, positive integers, decimals, and fractions and understand the relationship between decimals, fractions, and percents. They understand the relative magnitudes of numbers:								
	1.1 Estimate, round, and manipulate very large (e.g., millions) and very small (e.g., thousandths) numbers.				•		*Worms Eat Our Garbage*	"Weigh in Concepts," p. 133: After reading information on the number of worms in soil, students calculate the answers to questions.	ELA R 2.3
	1.2 Interpret percents as a part of a hundred; find decimal and percent equivalents for common fractions and explain why they represent the same value; compute a given percent of a whole number.				•		*Worms Eat Our Garbage*	"Population of Change," p. 110: Students calculate the percentage change in the population of worms for a number of soil types.	
					•		*Closing the Loop*	"Performing a Class Audit of Waste," p. 321: Students evaluate and record the waste stream over a period of days, then calculate percentages and compare types of waste.	MATH MR 2.6; STATS 1.3
			•				*Nutrition to Grow On*	"Food Labels," p. 79, Nutrition Activities: Students learn to read Nutrition Facts labels and learn how the percentage of daily recommended nutrients in a serving of food is calculated. Using a point card, students compare nutritional values of different foods.	ELA R 2.1
						•	*Junior Master Gardener*	"Earth Apple," p. 35: Students divide into sections an apple, which represents Earth, to illustrate the percentages of land and fresh and salt water.	

Key: ELA—English–Language Arts; L&S—Listening and Speaking; MATH—Mathematics; M&G—Measurement and Geometry; MR—Mathematical Reasoning; NS—Number Sense; R—Reading; SCI—Science; STATS—Statistics, Data Analysis, and Probability; W—Writing

Table 5.3 Activities that support mathematics standards (Continued)

	Standards		Content areas: Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	Instructional materials	Activities	Links to other grade 5 standards
Number Sense	2.0 Students perform calculations and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals:	2.3 Solve simple problems, including ones arising in concrete situations, involving the addition and subtraction of fractions and mixed numbers (like and unlike denominators of 20 or less), and express answers in the simplest form.			•			*Kids Cook Farm-Fresh Food*	Recipes in each section: While following the recipes for preparing food, students determine quantities of ingredients for different numbers of people.	MATH NS 2.5
		2.5 Compute and perform simple multiplication and division of fractions and apply these procedures to solving problems.			•			*Kids Cook Farm-Fresh Food*	Recipes in each section: While following the recipes for preparing food, students determine quantities of ingredients for different numbers of people.	MATH NS 2.3
Algebra and Functions	1.0 Students use variables in simple expressions, compute the value of the expression for specific values of the variable, and plot and interpret the results:	1.1 Use information taken from a graph or equation to answer questions about a problem situation.	•					*Junior Master Gardener*	"Shake, Rattle and Roll," p. 26: Students identify the layers of soil texture and graph the height of layers of particles. From the graph students classify the texture of the soil.	SCI 1.f, 6.a MATH STATS 1.2
						•		*Worms Eat Our Garbage*	"How Many Worms," p. 135: Students interpret graphs and calculate averages.	

Standards		Content areas: Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	Instructional materials	Activities	Links to other grade 5 standards
Measurement and Geometry									
1.0 Students understand and compute the volumes and areas of simple objects:	1.3 Understand the concept of volume and use the appropriate units in common measuring systems (i.e., cubic centimeter [cm^3], cubic meter [m^3], cubic inch [in^3], cubic yard [yd^3]) to compute the volume of rectangular solids.				•		*Worms Eat Our Garbage*	"Worm Bedding Calculations," p. 71: To find how much bedding is required for their worm bin, students complete certain steps, including measuring a bin and calculating the volume of garbage.	MATH M&G 1.4
					•		*Worms Eat Our Garbage*	"How Big a Bin," p. 70: Students study a chart that indicates how big a bin should be to handle different amounts of garbage and look at pictures indicating different shapes of bins containing the same volume. They then answer questions.	
Statistics, Data Analysis, and Probability									
1.0 Students display, analyze, compare, and interpret different data sets, including data sets of different sizes:	1.1 Know the concepts of mean, median, and mode; compute and compare simple examples to show that they may differ.				•		*Worms Eat Our Garbage*	"Wild Worms," p. 134: From data on the weight of worms in different soils, students calculate averages.	
	1.2 Organize and display single-variable data in appropriate graphs and representations (e.g., histogram, circle graphs) and explain which types of graphs are appropriate for various data sets.				•		*Worms Eat Our Garbage*	"Organizing Worms," p. 74: Students analyze a set of data by organizing it into a histogram and bar graph.	
			•				*Project Food, Land & People: Resources for Learning*	"Why I Buy," p. 517: Students read about techniques used in advertising, explore their own buying habits, then write and conduct a survey on peanut butter brands. They graph their findings.	ELA L&S 1.7
				•			*Kids Cook Farm-Fresh Food*	"Frozen, Canned, or Fresh: Which Do You Prefer?" p. 88: Students survey the preferences of students for spinach and determine ways to display their findings.	

Key: ELA—English–Language Arts; L&S—Listening and Speaking; MATH—Mathematics; M&G—Measurement and Geometry; MR—Mathematical Reasoning; NS—Number Sense; R—Reading; SCI—Science; STATS—Statistics, Data Analysis, and Probability; W—Writing

Table 5.3 Activities that support mathematics standards (Continued)

	Standards		Content areas: Gardening	Nutrition	Cooking	Waste mgmt.	Ag. systems	Instructional materials	Activities	Links to other grade 5 standards
Statistics, Data Analysis, and Probability	1.0 Students display, analyze, compare, and interpret different data sets, including data sets of different sizes:		•			•	•	*Kids Cook Farm-Fresh Food*	"Making Compost 'Tea,'" p. 78: Students make compost "tea," a preparation used to improve the soil. They conduct an experiment to determine the effects of adding compost tea to plants. They collect and display data.	SCI 6.g
				•				*Fruits and Vegetables for Health*	"Nutritional Value of Fresh Produce," p. 27: Students use data provided on vitamin A, vitamin C, and fiber in fruits and vegetables to create bar graphs and analyze the information.	MATH NS 1.2; STATS 1.2
		1.3 Use fractions and percentages to compare data sets of different sizes.				•		*Closing the Loop*	"Performing a Class Audit of Waste, p. 321: Students evaluate and record the waste stream over a period of days, then calculate percentages and compare types of waste.	MATH MR 2.6; NS 1.2
Mathematical Reasoning	2.0 Students use strategies, skills, and concepts in finding solutions:	2.1 Use estimation to verify the reasonableness of calculated results.		•				*Nutrition to Grow On*	"Serving Sizes," p. 59, Nutrition Activities: Students review the Food Guide Pyramid, identify proper serving sizes, compare with familiar objects, calculate the serving size by using measurement tools, and determine what they need to eat for the rest of the day to meet the Food Guide Pyramid recommendations.	

Lesson 1: Elements Matter: Soil Testing & Amending

California Education Standards: 1b, 1h

Time: 45 minutes

Materials:

- Teacher and student workbooks
- Pencils, regular
- Soil Testing Kits: ~~NPK and~~ ~~pH~~ strips 2009-10 - Do Both NPK/pH 2012-13 - Do Both NPK/pH
- Glass Jars (6)
- Soil samples
- Amendments: worm castings, compost, organic fertilizer, chemical fertilizer
  small

Plan:

Welcome to the garden.

Discuss rules.

- Discuss N, P and K and why they are important to plants white
- > Where plants get carbon

Have students collect soil samples and prepare them with water

Test the samples – one type per class

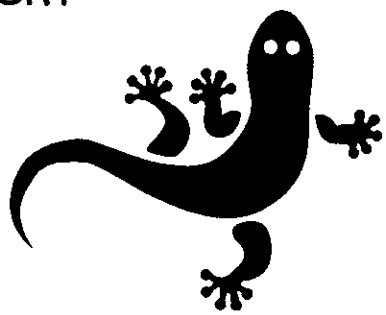
~~Compare them with amended soil~~

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

Gecko Garden

Outdoor Science Lab

Student Agreement

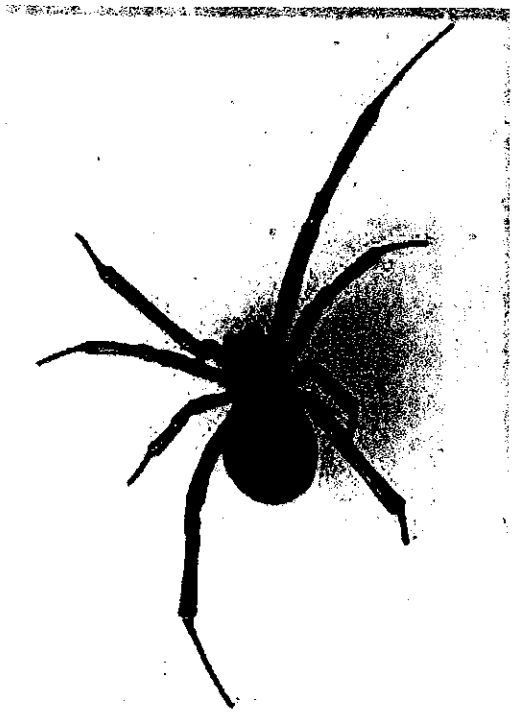


I agree to...

- ☐ 1) Use a quiet voice.
- ☐ 2) No running.
- ☐ 3) Always keep working end of tools down.
- ☐ 4) Ask before picking or eating any plants
- ☐ 5) Not put my hands in places I can not see.
- ☐ 6) Wash my hands when I am finished gardening.
- ☐ 7) Respect plants, animals and each other.

Black Widow Spider

TOP

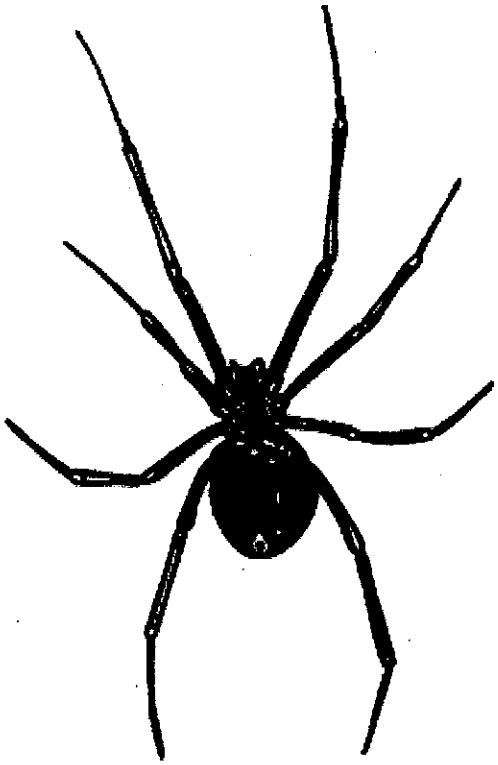


Kingdom: Animalia
Phylum: Arthropoda
Class: Arachnida

_____ legs

_____ body sections

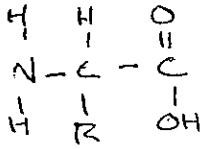
BOTTOM



5th Grade

- Remember last year? plant - peas
  soil test ?

Elements	Source	Products
N	Soil (compost, fertil)	Protein DNA
K	Soil	
P	Soil	ATP, DNA
C	Air (CO_2)	Carbohydrate (sugar)
O	Air (CO_2)	Carbohydrate
H	Water (H_2O)	"



Soil Test : Pre / Post Amendment

Day 1

Group 1 : Amend, Till soil, Collect sample | plant seeds

Group 2 : N, P K - prep | Read Results, record

Day 2

- 2nd Soil Test
- Garden journal

pH Test

1) Collect soil sample
2) Put soil in test chamber up to soil mark.
3) Carefully open green capsule and pour powder into test chamber
4) Using the dropper add water to fill line
5) Put on cap tightly then shake
6) Allow to settle. Read color after about 1 minute.

Color greenishbrown pH 6.5, slightly acidic

Circle One:

Alkaline Neutral Acid

Peas grow best in soils with pH ranging from of 6.0 to 7.5. Does our soil test indicate that it is acceptable for peas?

Yes.

Lesson 2: Tubers

Materials:

- Teacher and student workbooks
- Pencils, regular
- Seed potatoes
- Hand tools
- Rulers

Potatoes are a form of tuber. Tubers are a modified plant stem. Though potato plants do produce seeds, plants grown from seeds have low yields, therefore potatoes are generally grown from the eye of an existing potato. These are often called "seed potatoes".

Read 'Easy Gardening…Irish Potatoes' for background information on how to plant before you begin with the students.

If class time allows, have students read the background information and cut the seed potatoes into quarters a day or two before planting. ~~Set the pieces in the sun to cure the skin. Bring them in at night so they do not get moist~~.

Explain Group Activities.

- Garden Group
  - Form mounds as specified in the reading.
  - Lay out drip line and stake in area to be planted
  - Plant potato pieces 3" deep and 12" apart. Have students measure with a ruler. (It is a good idea to try to plant the potatoes near a drip outlet in the line.)
- Table group:
  - Journal entries

Divide into groups and switch after approximately 10 minutes.

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

The Agriculture Program of the Texas A&M University System
Extension Horticulture Information Resource

Easy Gardening... Irish Potatoes

B. Dean McCraw, Extension Horticulturist
Texas Agricultural Extension Service

Since the average American eats about 125 pounds of potatoes and potato products each year, Irish potatoes are one of America's most popular vegetables. Irish potatoes are a cool season crop; they grow best in early spring and late fall when the days are warm and the nights are cool. Although the potato is a cool-season crop and the edible part of the plant is an underground stem called a tuber (not a root), the tops of the plant will not withstand frost. Potatoes need full sun for best production.

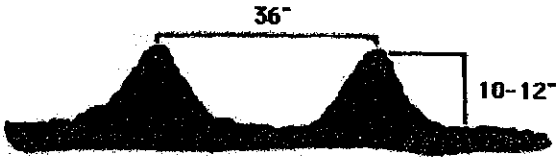


Figure 1

Soil Preparation and Fertilization

Figure 2

Potatoes do best in a loose, well-drained, slightly acid soil. Poorly drained soils often cause poor stands and low yields. Heavy soils can cause tubers to be small and rough.

Remove rocks, large sticks and trash from the soil before spading. Spade the soil 8-12 inches deep. Turn the soil ɜr to cover all plant material. Work the soil into beds 10-12 inches high and 36 inches apart (see ı ıgure 1). Bedding is very important for drainage.

Because potatoes need adequate fertilizer in early season, apply most of the fertilizer just before planting. Use 2 to 3 pounds of complete fertilizer such as 10-20-10 for each 30 feet of row in bands 2 inches to each side and 1 inch below the seed piece. The fertilizer should not touch the seed piece. To apply the fertilizer, flatten the beds so they are 6 to 8 inches high and 10 to 12 inches wide (see Figure 2).

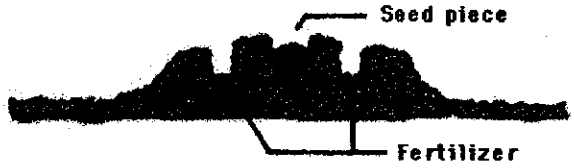


Figure 3

Using the corner of a hoe or stick, open a trench about 4 inches deep on each side of the bed. Apply half of the fertilizer (about 2 cups for each 30 feet of row) in each trench. The seed pieces will be planted in a row between the two bands of fertilizer (see Figure 3).

next page

Hypertext markup and graphics colorization by Gretchen Eagle and Dan Lineberger.
http://aggie-horticulture.tamu.edu/extension/easygardening/potato/potato1.html

Preparation of Seed

Irish potatoes are not grown from seed like most other vegetables. Instead, pieces from the potato itself start new plants. Home gardeners should purchase good seed potatoes that are free of disease and emicals. Do not buy potatoes from a grocery store for planting.

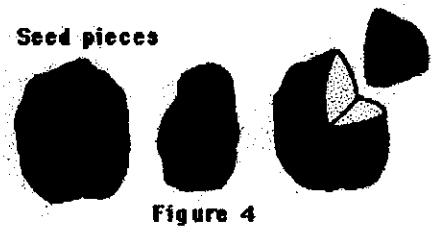


Figure 4

The seed potato contains buds or "eyes" which sprout and grow into plants. The seed piece provides food for the plant until it develops a root system. Too small a seed piece produces a weak plant. Large seed potatoes for the spring crop should be cut into pieces which weigh about 1 1/2 to 2 ounces (about the size of a medium hen egg). Each seed piece must have at least one good eye (see figure 4). Cut the seed 5 or 6 days before planting. Hold the cut seed in a well-ventilated spot so it can heal over to prevent rotting when planted in cold, wet or very hot weather. Plants killed by a late spring frost will not come back if the seed piece is rotten. One pound of seed potatoes will make 9 to 10 seed pieces.

For fall-grown potatoes, most Texas gardeners plant small, uncut potatoes since they are more resistant to rotting in hot weather than cut potatoes. Potatoes have a rest period which must be broken before they will sprout. The rest period is more easily broken in small, mature potatoes. Select mature potatoes about 1 1/2 inches in diameter for fall planting. To be sure the rest period is broken, store the small seed potatoes under warm, damp conditions for 2 weeks before planting by placing them in a shady spot and covering them with moist burlap bags or mulch. The potatoes should have small sprouts at planting time.

Seed usually is more available in the spring than in the fall. Many gardeners choose to buy extra seed in the spring and hold it over for fall planting. To do this, keep the potatoes in a cool, humid spot such as the bottom of a refrigerator. Do not save your potato seed more than one year. This can cause buildup of us disease which will reduce yield.

Planting

Potatoes should be planted when the soil temperature 4 inches deep reaches about 50 degrees F, or about 3 weeks before the last spring frost. Potatoes should be planted in February or early March in most areas of Texas. If planted too early the tops can be frozen off by spring frost. For a fall crop, plant about 110 days before the first expected frost, or mud-August in most areas.

Figure 5

Use a hoe or stick to open a trench about 3 inches deep down the center of the bed. Drop seed pieces 10 to 12 inches apart in the trench (see Figure 5). Step on each seed piece after dropping it to assure good contact with the soil. cover the seed about 3 inches deep. If covered too deeply, the plants will be slow to break through the soil and will be more subject to disease and seed decay.

Varieties

The most common type of Irish potatoes are red or white. Most red varieties store longer than white varieties. Most white varieties have better cooking qualities than red varieties. Many gardeners plant some of each in the spring. The whites are used first and the reds stored for later use.

Care After Planting

All tubers produced on a potato plant come from above the seed piece. Since the seed piece is planted only 3 inches p, soil must be pulled toward the plant as it grows. This allows a place for the tubers to form. Some gardeners use a thick mulch for this purpose. Tubers formed in a soft mulch often are smoother and better shaped than those grown in soil. This is especially true if the soil is heavy. (see Figure 6).

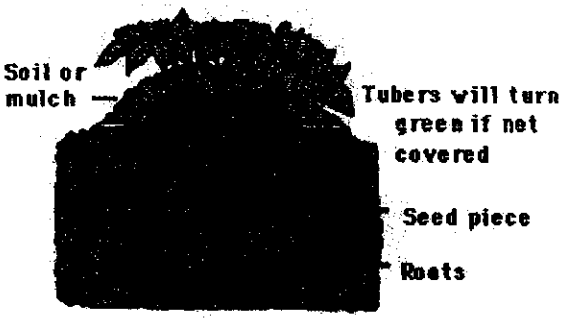


Figure 6

As the tubers enlarge they must be protected from sunlight. Exposure to sunlight causes them to turn green. A thick layer of mulch applied when the plants are 8 to 10 inches tall can reduce soil temperature and increase yield and quality.

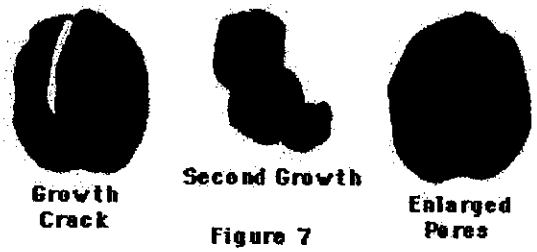


Figure 7

The soil moisture supply should be kept constant during growth. The plant must have adequate moisture and fertilizer when the tubers are forming. This usually occurs when the plants are 6 to 8 inches tall. Apply 1 cup of fertilizer for each 30 feet of row beside the plants when they are about 4 inches tall. Water the fertilizer into the soil. This is especially important on sandy soils.

Moisture stress followed by irrigation or rainfall can cause growth cracks and second growth. If the rainfall is accompanied by hot weather, the rest period of developing tubers can be broken and can cause the tubers to sprout in the soil (see Figure 7). Too much water causes enlarged pores on tubers and makes them easily in storage.


Figure 8

Potato plants usually produce flowers and sometimes produce fruits. The fruits bear the true seed of the potato plant. They look like small tomatoes but cannot be eaten. Potato plants do not cross with tomato plants (see Figure 8).

Harvesting and Storing

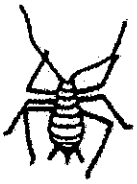
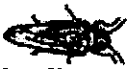
Potatoes are ready to harvest when the tops begin to die and the skin becomes firm on the potato. The skin is set when it does not scrape easily when rubbed with the thumb. Skin set can be speeded by cutting back the tops to the plants. Most of the potatoes should weigh 6 to 12 ounces at harvest. Harvest small, "new potatoes" during the growing season by carefully digging beside the plants with the fingers.

To harvest potatoes, dig under the plants with a shovel or spading fork. Keep the fork 8 to 10 inches away from the plant to prevent cutting the potatoes. Raise the plants and shake away the soil. Potatoes should be dug when the soil is moist. If it is too wet, the soil will stick to the potatoes. If too dry, clods will bruise the potatoes. Pull the potatoes from the vines and handle them carefully to prevent damage since damaged potatoes do not store well.

Allow the potatoes to dry, then store them in a cool spot with plenty of air movement. Most potato varieties are ready to dig 95 to 110 days after planting.

first page | previous page | next page

Insects

Name and Description		Control
 Adult  Larvae Colorado Potato Beetle	Adult: 3/8 inch long; black and yellow stripes; feeds on leaves. Larvae: up to 3/8 inch long; red, light orange, two rows of black dots on each side; softbodied; feeds on leaves	Sevin
 Flea Beetle	1/16 inch long; metallic bronze, black, blue or green; fast jumping beetle; eats small round holes in leaves	Sevin
 Aphid	1/8 inch long; softbodied; green, pink, red or brown; usually on underside of leaves; sucks plant juice	Malathion
 Leafhopper	green; wedge shaped; up to 1/8 long; crawls sidewise when disturbed; sucks juices form leaves; leaves curl upward and turn yellow to brown	Sevin
 Wireworm	1/2 to 1 1/2 inch long; yellow-white, dark head and tail; slender; feeds on tubers	Diazinon

Before applying any pesticide always read the label. Follow cautions, warnings and directions.

Diseases

Potatoes are troubled by several diseases. Treatment of seed pieces with a fungicide prior to planting can be helpful. Your county Extension agent can provide information on what to use.

A good rotation program is effective in controlling most potato diseases. If possible, do not plant potatoes in the same place more than once each 3 years. Do not follow or precede potatoes with eggplant, okra, pepper or tomato. Seed piece treatment is especially important if your garden is too small for adequate rotation.

Serving

Irish potatoes contain 2% protein and 18% starch. They are an inexpensive source of carbohydrates and

provide a good quantity of vitamins and minerals when properly prepared. Green areas on potatoes should be peeled away before cooking. Your county Extension agent has suggestions on how to prepare and serve Irish potatoes.

ın-up

After the potatoes are dug, place the tops in the compost pile. The spring potato crop often can be followed with a summer crop such as southern peas.

Lesson 3: Competitors

Materials:

- Teacher and student workbooks
- Pencils, regular
- Gloves

Discuss how weeds compete for plant resources. Be sure students are aware of Stinging Nettle.
Optional Activity: Discuss plant modifications, in addition to tubers, used to store sugar over winter.

Explain Group Activities.

- Garden Group
  - Observe potato growth
  - Pull weeds
- Table group:
  - Journal entries
  - Optional Activity: Winter Storage Organs in Plants

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: Nutrients

Materials:

- Teacher and student workbooks
- Pencils, regular
- Compost

Plan: When plants are about 4" tall add additional compost and water around base. When plants are about 10" tall mound up more soil around the base. Developing tubers should not be exposed to sunlight.

Explain Group Activities.

- Garden Group
  - Feed potatoes
  - Mound if necessary
  - Weed
- 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)

Lesson 5: Maintenance

Materials:

Teacher and student workbooks
Pencils, regular

If not completed last visit, add additional compost when plants are about 4" tall. When plants are about 10" tall mound up more soil around the base. Developing tubers should not be exposed to sunlight.

It is normal for potato plants to die as they approach the time to harvest. Foliage will almost completely die back when it is time to harvest. Keep the plants watered until about 3-7 days prior to harvest.

Optional: Discuss the process of photosynthesis and respiration in plants.

Explain Group Activities.

- Garden Group
  - Observe potatoes.
  - Mound if necessary
- Table group:
  - Find That Veggie
  - 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)

Lesson 6: Harvest

Materials:

- Teacher and student workbooks
- Pencils, regular
- Gloves
- Potato sacks or cardboard boxes

Plan: The skin of the potato is very delicate; students should be advised not to scratch the surface. When they are dug out of the soil, let sit for about one day before the dirt is lightly brushed off.
Store potatoes in a cool, dark location until market.

Explain Group Activities.

- Garden Group
  - Harvest

- 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)