

Student Leadership

Pathway Through a California Natives Garden

Subject Area: Student Leadership
Date: 8/1/2012

Grade Levels: 7th & 8th grade
Teacher: Danielle Hanosh
School: Bridgeway Island Elementary School

Lesson Overview

Students will use their knowledge of mathematics, language arts, and technology to design and create the pathways through a new California native garden located on the school campus. The students will be working together on teams to design and create concrete forms, and pour and finish (with salt, stamps, and mosaic tiles) concrete stepping stones. Students will use the finished stepping stones to design and build a stone pathway through the garden complete with a sand bed, underfoot drip system, and groundcover. Additionally, students will also learn to identify California native plant and animal species using a dichotomous key.

Materials Included in this Lesson

- Scale drawing sample
- Trees and Shrubs of California (Book by John Stuart)
- Power Point presentation on pathways
- Design worksheet for pathways
- Dichotomous Key worksheets
- Reflection/Evaluation forms
- Safety handouts
- Wood framing
- Concrete mix / water
- Buckets, hand tools, shovels
- Coarse salt (for concrete finish)
- Mosaic tiles
- Coarse sand
- Groundcover (thyme)
- Drip system pipes, timer, fittings, etc.

Other Materials for this Lesson

- Hammers and nails
- Plywood sheets
- Concrete color and stamps
- Computers with internet connection
- Dichotomous Key
- Calculators, pencils, rulers
- Waterproof plant labels
- Metal stakes
- Wildlife photos for identification
- Plant material samples for identification
- Rubber gloves

Skills the Student will Learn

Student Deliverables

- Students will learn how to identify plants and animal using a dichotomous key.
- Students will be able to label California native plants by scientific and common names.
- Students will be able to design and create a wooden stepping stone frame.
- Students will be able to pour and finish concrete stepping stones.
- Students will be able to design a pathway scale drawing.
- Students will be able to install a drip system.
- Students will learn dig a sand bed, secure stepping stones and plant filler groundcover.
- Dichotomous Key Identification Worksheet (beans)
- Created dichotomous key (animals)
- Dichotomous Key Identification Worksheet (CA native plants)
- Pathway design and scale drawing of pathway
- Stepping stones (2/student)
- Informational signage (2/student)
- Project Reflection/Evaluation

Length of Lesson: 20 Days

Activity Day One –

Introduction to California Native Garden Pathway Project
Pathway PowerPoint #1

Activity Day Two –

Stepping stones
Designing wooden frames scale drawings

Activity Day Three –

Safety training
Create stepping stone frames

Activity Day Four –

Mix, pour, and finish concrete - Day 1
Salt finish, color and stamping

Activity Day Five –

Mix, pour, and finish concrete - Day 2
Mosaic tile placements

Activity Day Six –

Pathway PowerPoint #2
(Sand bed, ground cover, and drip system installation)

Activity Day Seven –

Pathway design sketch
Scale drawing of pathway

Activity Day Eight –

Plant and animal identification
How to use a dichotomous key (Bean identification activity using garbanzo, kidney, white northern, pinto, black).
Create a dichotomous key (domestic animals)

Activity Day Nine –

Identifying and labeling California native plants
Plant samples and dichotomous key worksheet

Activity Day Ten –Eleven

Pathway PowerPoint #3 – Informational Signage
Creating California Native plant labels and informational signage

Activity Day Twelve-Eighteen (Note: Number of Days for installation depends upon schedule of UC Davis Native Plant Specialists who will be working to create the garden). –

Installation of Pathway
Measure and dig sand bed and pour sand
Plant ground cover

Install Drip system
Lay Stepping Stones

Activity Day Nineteen–
Place Plant Identification Labels

Activity Day Twenty–
Pathway Dedication and Project Reflections/Evaluations

Enrichment Suggestions

- Students can use dichotomous keys to identify plants and animals in their neighborhood
- Students can model plant identification for younger students
- Students can teach younger students how to make the stepping stones using the forms they created.

Student Resources

Plant identification –

- Trees and Shrubs of California (Book by John Stuart)
- Californiagardens.com/lists/native.htm
- Californianativeplants.com

Concrete Textures –

- Concretenetwork.com

Foundation Academic Standards

- Mathematics 8.0 (Geometry) - Students know, derive, and solve problems involving the perimeter, circumference, area, volume, lateral area, and surface area of common geometric figures.
- Writing 2.2– Plan and conduct multiple-step information searches by using computer networks and modems.
- Writing 1.2 – Produce legible work that shows accurate spelling and correct punctuation and capitalization.
- Writing 1.6 – Revise writing for word choice; appropriate organization; consistent point of view; and transitions between paragraphs, passages, and ideas.
- Writing 1.7 – Use systematic strategies to organize and record information.

- Career Planning and Management 3.0 – Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers (as pertaining to the building industry).

CTE Pathway Standards

- D4.2 (Building Trades and Construction) Understand how to estimate materials from blueprints and specifications.
- D5.6 – Develop a prototype from plans and test it (Wooden stepping stone frames).
- E8.2 – Know how to use a dichotomous key to identify plants and animals.
- E8.3 - Know how to identify local trees, shrubs, grasses, forbs, and wildlife species by common name.
- F5.2 - Know basic irrigation design and installation methods.
- F9.2 Operate and maintain selected hand and power equipment safely and appropriately.

Include a bulleted list of CTE Pathway Standards by number with an abbreviated description of the standard: (<http://www.cde.ca.gov/be/st/ss/>)

Lesson Plan Relevance to Externship

This lesson is related to the landscape design principles learned through the externship at Environmental Landscape Solutions. In order to maximize water efficiency (as in the water wise garden built by ELS) the students will learn how to install a timed drip system and select California native plants that will not need a great deal of water after their initial establishment period. Students will also use the pathway design principles to create a safe and visually appealing walkway through the garden. Finally, they will learn how to use informational materials and technology to identify plant and animal species.

Rubric for the California Native Garden Pathway Project

Student Deliverables	4 Exceeds Expectations	3 Meets Expectations	2 Approaches Expectations	1 Fails to meet Expectations
Dichotomous Key (Beans)	Student uses dichotomous key to correctly identify all samples and samples are organized, glued, and labeled perfectly onto identification chart.	Student uses dichotomous key to correctly identify most samples and samples are organized, glued, and well labeled onto identification chart.	Student uses dichotomous key to correctly identify some samples and samples are organized, glued, and labeled somewhat correctly onto identification chart.	Student is not able to label or organize samples using the dichotomous key.
Dichotomous Key (Domestic Animals)	Student creates dichotomous key that is neat, organized and easily followed with precise adjectives describing samples.	Student creates dichotomous key that is fairly neat, organized and easily followed with somewhat precise adjectives describing samples.	Student creates dichotomous key that is messy, disorganized and difficult to follow with vague adjectives describing samples.	Student creates sloppy and unusable dichotomous key.
Dichotomous Key (CA Native Plants and Animals)	Student uses dichotomous key to correctly identify all samples and samples are organized, glued, and labeled perfectly onto	Student uses dichotomous key to correctly identify all samples and samples are organized, glued, and labeled perfectly onto	Student uses dichotomous key to correctly identify all samples and samples are organized, glued, and labeled perfectly onto	Student uses dichotomous key to correctly identify all samples and samples are organized, glued, and labeled perfectly onto

Pathway Sketch and Scale Drawing	Student creates sketch of pathway that includes all elements of groundcover, stepping stones and drip system. Student uses approved sketch to create an accurate scale drawing of the pathway.	Student creates sketch of pathway that includes most elements of groundcover, stepping stones and drip system. Student uses approved sketch to create a nearly accurate scale drawing of the pathway.	Student creates sketch of pathway that includes some elements of groundcover, stepping stones and drip system. Student uses approved sketch to create a somewhat accurate scale drawing of the pathway.	Student creates sketch of pathway that omits many elements of groundcover, stepping stones, and drip system. Student uses approved sketch to create an inaccurate scale drawing of the pathway.
Stepping Stones (2 per student)	Student creates square, octagonal, or hexagonal wooden frames using accurate measurements, pours concrete safely and according to specifications and makes a concerted effort to decorate stones in a visually appealing manner.	Student creates square, octagonal, or hexagonal wooden frames using somewhat accurate measurements, pours concrete safely and nearly according to specifications and makes an effort to decorate stones in a visually appealing manner.	Student creates square, octagonal, or hexagonal wooden frames using somewhat accurate measurements, pours concrete safely but not according to specifications and makes little effort at decorating stones in a visually appealing manner.	Student creates square, octagonal, or hexagonal wooden frames without using accurate measurements, pours concrete unsafely and/or not according to specifications and makes no attempt to decorate stones in a visually appealing manner.
Informational Signage (2 per student)	Student creates two informational signs include the plant's scientific name and common name. Signs are neat, free of errors, and visually appealing.	Student creates two informational signs include the plant's scientific name and common name. Signs are somewhat neat, free of errors, and visually appealing.	Student creates two informational signs include either the plant's scientific name or common name. Signs are messy, erroneous, and contain little visual appeal.	Student creates two informational signs include either the plant's scientific name or common name. Signs are very messy, erroneous, and contain no visual appeal.

Name:
Date:
Period:

Dichotomous Key Worksheet - Beans

Directions: Use the dichotomous key below to identify the bean samples. When finished, glue one bean into each box on the chart.
Label it with its name and a few distinguishing features.

- | | |
|-------------------------------|-----------------------|
| 1a. Bean round | Garbanzo bean |
| 1b. Bean elliptical or oblong | Go to 2 |
| 2a. Bean white | White northern |
| 2b. Bean has dark pigments | Go to 3 |
| 3a. Bean evenly pigmented | Go to 4 |
| 3b. Bean pigmentation mottled | Pinto bean |
| 4a. Bean black | Black bean |
| 4b. Bean reddish-brown | Kidney bean |

Name:
Date:
Period:

Dichotomous Key Worksheet – Domestic Animals

Directions: Create a dichotomous key below to help people identify the domestic animals. When finished, create a key by gluing one animal picture into each box on the chart. Label it with its name and a few distinguishing features.

- 1a.
- 1b.
- 2a.
- 2b.
- 3a.
- 3b.
- 4a.
- 4b.
- 5a.
- 5b.

Name:
Date:
Period:

Dichotomous Key Worksheet - Conifers

Directions: Use the dichotomous key below to identify the conifer tree samples. When finished, glue one sample into each box on the chart. Label it with its name and a few distinguishing features.

A Key to Selected North American Native and Introduced Conifers

- | | | |
|-----|---|--|
| 01a | Leaves needle-like | Go to 02 |
| 01b | Leaves flattened and scale-like | Go to 27 |
| 02a | Leaves are in clusters | Go to 03 |
| 02b | Leaves are borne singly | Go to 15 |
| 03a | Two to five leaves in a cluster | Go to 04 Genus <i>Pinus</i> |
| 03b | More than five leaves in a cluster | Go to 14 |
| 04a | Leaves mostly 5 in a cluster | White Pine (<i>Pinus strobus</i>) |
| 04b | Leaves 2 or 3 in a cluster | Go to 05 |
| 05a | Leaves mostly 3 in a cluster | Go to 06 |
| 05b | Leaves mostly 2 in a cluster | Go to 08 |
| 06a | Leaves twisted, less than 5 inches long | Pitch Pine (<i>Pinus rigida</i>) |

- | | | |
|-----|---|--|
| 06b | Leaves straight, more than 5 inches long | Go to 07 |
| 07a | Leaves 5-10 inches long, cones very thorny | Loblolly pine (<i>Pinus taeda</i>) |
| 07b | Leaves mostly over 10 inches long, cones unthorned | Longleaf pine (<i>Pinus palustris</i>) |
| 08a | Leaves mostly longer than 3 inches | Go to 09 |
| 08b | Leaves mostly shorter than 3 inches | Go to 11 |
| 09a | Leaves rigid, bark grayish | Black pine (<i>Pinus nigra</i>) |
| 09b | Leaves narrower than 1.6mm; bark reddish brown or brown | Go to 10 |
| 10a | Cones thornless, twigs brown | Norway pine (<i>Pinus resinosa</i>) |
| 10b | Cones thorny, twigs whitish | Shortleaf pine (<i>Pinus echinata</i>) |
| 11a | Leaves mostly wider than 1.5 mm | Go to 12 |
| 11b | Leaves mostly narrower than 1.5 mm | Go to 13 |
| 12a | Leaves mostly longer than 35 mm | Mugho pine (<i>Pinus mugo</i>) |
| 12b | Leaves mostly shorter than 35 mm | Jack pine (<i>Pinus banksiana</i>) |
| 13a | Twigs whitened | Virginia pine (<i>Pinus virginiana</i>) |
| 13b | Twigs not whitened | Scotch pine (<i>Pinus sylvestris</i>) |
| 14a | Leaves deciduous, clusters of 20-40 | Larch (<i>Larix</i> sp.) |

14b	Leaves persistent, stiff, and four sided	True cedar (<i>Cedrus</i> sp.)
15a	Needles short and sharp	Giant Sequoia (<i>Sequoiadendron giganteum</i>)
15b	Needles longer than 12 mm	Go to 16
16a	Tiny pegs on twigs	Go to 17
16b	No pegs on twigs	Go to 22
17a	Pegs square, needles sharp	Go to 18 Genus <i>Picea</i>
17b	Pegs round, needles flat and blunt	Hemlock (<i>Tsuga</i> sp.)
18a	Leaves dark green or yellow green	Go to 19
18b	Leaves blue-green	Go to 20
19a	Branchlets droop	Norway spruce (<i>Picea abies</i>)
19b	Branchlets do not droop	Red spruce (<i>Picea rubens</i>)
20a	Leaves at right angles to stems	Blue spruce (<i>Picea pungens</i>)
20b	<i>Leaves point forward</i>	Go to 21
21a	Leaves about 12 mm long, seed cones 15-32 mm in length, crown narrow and pointed	Black spruce (<i>Picea mariana</i>)

21b	Leaves about 19 mm long, seed cones 50 mm in length, spire-like crown	White spruce (<i>Picea glauca</i>)
22a	Buds large and pointed	Douglas fir (<i>Pseudotsuga</i> sp.)
22b	Buds small and rounded	Go to 23
23a	Terminal buds round and clustered	True fir (<i>Abies</i> sp.)
23b	Terminal buds not clustered	Go to 24
24a	Needles white underneath	Go to 25
24b	Needles green underneath	Go to 26 Genus <i>Taxus</i>
25a	Needles pointed	Redwood (<i>Sequoia sempervirens</i>)
25b	Needles blunt	Hemlock (<i>Tsuga</i> sp.)
26a	Leaves 18 mm long or less with inconspicuous midrib	American Yew (<i>Taxus canadensis</i>)
26b	Leaves 25 mm long or more with conspicuous midrib	Japanese Yew (<i>Taxus cuspidata</i>)
27a	All leaves short and sharp	Giant Sequoia (<i>Sequoiadendron giganteum</i>)
27b	Some leaves not sharp	Go to 28
28a	Cones round	Go to 29

28b Cones not round

Go to 31

29a Cones soft and leathery

Juniper (*Juniperus* sp.)

29b Cones woody

Go to 30

30a Cones under 12 mm in diameter

False cypress (*Chamaecyparis*)

30b Cones over 12 mm in diameter

Cypress (*Cupressus*)

31a Cones resemble rosebuds

White cedar or arbor vitae

(*Thuja*)

31b Cones resemble duck bills

Incense cedar (*Calocedrus*)

