Teacher Preparation Materials
Patterns in the Garden

Observing patterns and shapes in nature gives us clues to how animals and plants survive and interact with each other and their environment. Filoli’s historic Garden provides abundant examples of natural and human-made patterns: the shapes of shrubs within the formal garden; time observed at the sundial; sound patterns made by birds; and the cycle of seasons explored through deciduous trees.

The curriculum is designed for Kindergarten through 2nd graders. For their 90-minute garden exploration, your students will use all their senses to observe nature, take time to draw and reflect, and will be given opportunities to inquire and discover.

Every student will receive a Nature Notebook that they will write and draw in throughout the field trip. We encourage you to review the notebooks as a class – students enjoy sharing what they observed with their teachers and classmates.

Pre- and post- field trip materials are included in this document. We hope you will use them to prepare students before the field trip and to continue the lesson in the classroom afterwards. This follow-up will strengthen the student’s connection to what they learned on the field trip.

Filoli’s staff and volunteers look forward to hosting your class. Please contact us with any questions prior to your field trip.

Reservations:
Taken online only at filoli.org/field-trips

Reservation Changes & Field Trip Day Contact:
Lisa Chai, Youth Programs Assistant
youthprograms@filoli.org, (650) 364-8300 x 252
Preparing For Your Field Trip

Field Trip Day

- Filoli is located at 86 Cañada Road in Woodside. You will be directed to bus parking by staff after the children unload.
- Meet staff at the picnic tables outside the Visitor Center.
- Arrive by 9:40 am to use bathrooms in the Visitor Center and have a snack.
- Field trip starts promptly at 10:00 am.*
- Field trip ends at 11:30pm. Your class is welcome to use the picnic tables for lunch.
- Divide each class into 3 groups before you arrive.
- Our guides appreciate when students and chaperones arrive wearing nametags.
- There is nowhere to store backpacks or lunches. Please leave them in the car/bus. Filoli will provide your chaperones with a tote bag to carry the children's water bottles.
- Field trips are only canceled in heavy rain. Contact us the day prior to your field trip if you are concerned about rain. Filoli’s cancellation policy is listed on filoli.org/field-trips.

*Filoli can accommodate late start schools or schools with a long drive. Contact us immediately after making your reservation to change your start time.

Note that your field trip includes a visit to the Garden and Nature Preserve but not the House.

Information For Parents

Please ask parents to prepare their children for their garden adventure by doing the following:

- Pack a water bottle, hat, and clothes appropriate for the weather.
- Generously apply sunscreen at home. Students will be outside for the entire field trip.
- Field trips are held in light rain. If it is raining, send students with a raincoat and a change of shoes and socks for after the field trip.
Preparing Chaperones for the Field trip

Chaperone Policy

- Is your class taking a bus? The maximum number of adults is 5, including the teacher.
- Is your class taking cars? You may bring 1 adult for every 3 students, including the teacher.
- These ratios will be strictly enforced. Classes that exceed the number of allowed adults will be asked to pay general admission prices for the additional adults. Payment for additional adults can only be made on the day of the field trip. Additional adults may not accompany the field trip. They may explore the House and Garden on their own.

Preparing the Chaperones

Filoli values the contributions and involvement of chaperones and we thank them for being part of this experience. We’d like to share ways in which chaperones can enhance the students’ experience, and also ask them to avoid situations that detract from the experience.

Add to the experience!

- Set an example for the students by following the field trip rules.
- Be responsible for the safety of the students by ensuring they follow field trip rules.
- Keep the focus on the students’ learning experience by limiting your own questions and comments to the guide.
- Carry the students’ water bottles. Filoli will provide a tote bag.
- Help students find pages in their Nature Notebook when prompted by the guide.

These actions detract from the students’ experience:

- Talking on your cell phone, with the teacher, or with other chaperones in your group.
- Photography is distracting for the students and guides. We encourage taking a few photos to capture and share the experience, but please limit photography.
- Asking students or guides to stop and pose for photographs.
- Asking the guides many questions. Please let the students ask and answer questions.

Siblings are not permitted on the field trip.
Curriculum Connections

Connections can be made to multiple Disciplinary Core Ideas in the Next Generation Science Standards and to California’s History–Social Science Content Standards.

Patterns in the Garden Theme
Observing patterns in nature gives us clues to how animals and plants survive and interact with each other and their environment. People create patterns to add beauty or function to a garden.

Crosscutting Concepts

Patterns:
Patterns in the natural and human-designed world can be observed, used to describe phenomena, and used as evidence. Observed patterns of forms prompt questions about relationships and the factors that influence them. Patterns exist everywhere in regularly occurring shapes and can be seen in an unfurling fern, a radial petal formation in a flower, and rows in a vegetable garden. Patterns also occur through repeating seasons and events - sunrise and sunset.

Structure and Function:
The shape and stability of structures of natural objects are related to their function. The spiral fiddlehead of a fern protects the new growth from the elements and from predators as it unfurls. The showy radial petals of a flower encircles a target for a pollinator. The veins in a leaf move water through the plant and create stability so the leaf can weather the elements and maximize surface area for sunlight absorption.
Cause and Effect:
Events have causes that generate observable patterns. Spring brings flowers are visited by bees. The sun rises and warms the ground each morning, which brings out lizards to sunbathe and warm their blood. Weather in late fall triggers the leaves of Filoli’s elm trees to turn yellow each fall. Winter causes some skunks and squirrels to hibernate.

Science and Engineering Practices
Students use scientific and artistic methods of observation to identify, document, and draw structures of plants and animals and discuss the purpose of these structures. Through their interactions with Filoli Guides, they practice analyzing and interpreting data, and obtaining, evaluating, and communicating information.

Nature Journaling
By drawing and writing in Filoli’s garden, students hone their skills of observation and documentation. Both are essential processes to begin learning as young scientists. Some students’ drawings might be wonderfully creative representations of their subject; other students who do not enjoy creating artwork might still document important and accurate details through drawing.

If you wish to further explore nature journaling with your students, the California Native Plant Society offers a free nature journaling curriculum.
## Curriculum Connections

<table>
<thead>
<tr>
<th>On their field trip and through use of their Nature Notebook, students will learn:</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patterns of the sun can be observed, described, and predicted through use of a sundial; the amount of daylight changes during different seasons</td>
<td>NGSS ESS1.B: Earth and the Solar System</td>
</tr>
<tr>
<td>Weather can be observed by describing how people respond to it (i.e. what are we wearing, how does the air feel)</td>
<td>NGSS ESS2.D: Weather and Climate HSSC: 1.2.4</td>
</tr>
<tr>
<td>To use scientific and artistic methods of observation to identify, document, and draw structures of plants and animals and discuss the purpose</td>
<td>NGSS LS1.A: Structure and Function</td>
</tr>
<tr>
<td>Plant and animals have different parts that help them survive and grow (i.e. camouflage on a lizard or veins in a leaf)</td>
<td>NGSS LS1.A: Structure and Function</td>
</tr>
<tr>
<td>Plants and animals need food, water, and light in order to live and grow. They obtain their food from other plants or animals</td>
<td>NGSS LS1.C: Organization for Matter and Energy Flow in Organisms</td>
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<tr>
<td>Plants and animals respond to external inputs: trees respond to season changes; lizards to temperature changes within a day; vines grow towards the sun</td>
<td>NGSS LS1.D: Information Processing</td>
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<tr>
<td>Through observing bee and bird activity in the garden, students will learn that plants depend on animals for pollination or to move their seeds around</td>
<td>NGSS LS2.A: Interdependent Relationships in Ecosystems</td>
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<tr>
<td>There are many different kinds of living things in any area. People introduce and grow plants from around the world to their gardens. Animals make those gardens their home. People use patterns to make gardens beautiful and functional.</td>
<td>NGSS LS4.D: Biodiversity and Humans HSSC: 2.4.1</td>
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Curriculum Connections

Next Generation Science Standards Grade Band Endpoints

ESS1.B: Earth and the Solar System
Seasonal patterns of sunrise and sunset can be observed, described, and predicted.

ESS2.D: Weather and Climate
Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.

LS1.A: Structure and Function
All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.

LS1.C: Information Processing
All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.

LS1.D: Information Processing
Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs.

LS2.A: Interdependent Relationships in Ecosystems
Animals depend on their surroundings to get what they need, including food, water, shelter, and favorable temperature. They use their senses to find food and water, and their body parts to gather, catch, eat, and chew the food. Plants depend on air, water, minerals, and light to grow. Animals can move around but plants cannot, and often they depend on animals to move their seeds around.

LS4.D: Biodiversity and Humans
There are many different kinds of things in any area, and they exist in different places on land and in water.
**History-Social Science Content Standards Connections (HSSC)**

1.2.4: Describe food production and consumption long ago and today, including the roles of farmers, processors, distributors, weather, and land and water resources.

2.4.1: Describe how location, weather, and physical environment affect the way people live, including the effects on their food, clothing, shelter, transportation, and recreation.
Pre- and Post-Field Trip Activities

Field Trip Checklist:
- Select from the prep activities to do in the classroom
- Email parents how to prepare their children for the field trip and the weather
- Email chaperones expectations listed on page 3
- Review field trip rules with students
- Review notebooks and post activities with students after the field trip

Bird Sounds
On their field trip, students will take a few minutes to sit quietly and listen to bird sounds in the garden. Prepare them for the activity by having them listen to bird sounds. Here are birds that are frequently seen or heard in Filoli’s Garden. Click on “Listen” located on the bird photo.

Red-shouldered hawk: https://www.allaboutbirds.org/guide/Red-shouldered_Hawk/

Dark-eyed junco: https://www.allaboutbirds.org/guide/Dark-eyed_Junco

Acorn woodpecker: https://www.allaboutbirds.org/guide/Acorn_Woodpecker/overview

California scrub jay: https://www.allaboutbirds.org/guide/California_Scrub-Jay/

Mystery Science
Could a statue's shadow move?
Students investigate what it takes to make a stationary object’s shadow move, and reflect on what this means about the sun’s place in the sky.
https://mysteryscience.com/sky/mystery-1

Why do you have to go to bed early in the summer?
In this Read-Along Mystery, Arushi wonders why she has to go to bed while the sun is still up, and learns that the sun stays up longer on some days than others.
https://mysteryscience.com/sky/mystery-4

What will the weather be like on your birthday?
Students use observations of the four classic seasons to spot patterns and thereby determine the seasons’ order. https://mysteryscience.com/watching/mystery-3
Mobile or Tree with Leaf Rubbings

Activity:
1) Collect leaves from the school or your neighborhood, or have each student bring in a leaf from their garden or neighborhood. Encourage them to choose the biggest leaf they can find. Note: This activity doesn’t work well with dried leaves.
2) Do a leaf rubbing on a white piece of paper. This works best with peeled crayons. Some leaves will be brown, red, yellow, or different shades of green. Use multiple crayon colors for each leaf.
3) Have students cut out their leaf rubbing.
4) Write on the back of the leaf rubbing:
   - The season
   - Leaf shape
   - Leaf edge type
   - Measurements: length, width
5) Attach leaves to string and hang on a mobile, or add them to a tree with branches on a bulletin board.
**Discussion:**

1) Have the students describe the shape of their leaf using the shapes on the next page.
2) Have students describe the edge of their leaf using the shapes on the next page.
3) Does the color of the leaf tell us what season it is?
4) Is there a pattern in the veins? Do both sides of the leaf match?
5) Is the leaf symmetrical or asymmetrical? If something is symmetrical, it has two halves that are exactly the same. Have them fold the original leaf in half. Do the halves match?
Leaf Shapes

oblong  oval  ovate

lobed  heart-shaped  round

Leaf Edges

smooth  jagged  wavy
Complete Notebook After Field Trip
Have students sit in groups with other students that were not in their group on the field trip. They can compare answers, drawings, observations, and share what they experienced as they fill out the uncompleted pages of the notebook.

Animals of Filoli Video
This video is a short compilation of the animals that live at Filoli that your students may not have seen on your visit: https://youtu.be/kDLn__mbRIM

Filoli Garden Shapes
Display the Garden photo. Have students count the different shapes (triangles, domes, circles). Then have them replicate the map on a piece of paper, or print copies and have them trace it and color it in. Students can also work together to create a three-dimensional model of a section of the garden using model magic or play dough.