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# Edible Schoolyard Garden Infrastructure and Systems

## Summary

Our garden infrastructure and systems directly inform how we run our classes. In the Edible Schoolyard garden, all of our systems and structures have been designed and built in collaboration with builders, artists, and students with the intention of empowering students to operate independently in the space and creating rich opportunities for exploratory learning. Below, we describe the major structures in our garden with notes on their design and use. We hope that this context will allow you to understand how our specific infrastructure and systems support our students' experience and the curriculum we teach. The intention of this document is to enable you to more easily adapt what you find useful or interesting to your own garden classroom.

### RAMADA

The Ramada is the central meeting place for beginning and ending each garden class. The 20-foot diameter weblike wooden structure is laced with deciduous kiwis that climb up the sides and canopy over the top, proving shade in the summer months and a feeling of intimacy and enclosure within the larger open space of the garden. Benches around the circumference provide more than 30 seats—enough for all the students, teachers, and volunteers in our typical garden class. The circular space allows for group discussions, demonstrations, tastings, and games. In the Ramada, students are held to the same behavioral expectations as in the classroom (i.e., engagement and focus).

### IRRIGATION

We primarily use drip irrigation in our annual beds and orchards with sprinklers in most of our perennial beds. A basic irrigation timer is used in our greenhouse so

the baby plants can get watered on the weekends and school holidays when we are not around.

### GREENHOUSE

The greenhouse allows garden teachers and students to propagate plants for the Edible Schoolyard garden, the annual plant sale, and donations for other local garden programs. In the greenhouse area we work with students to propagate plants by sowing seeds, using cuttings, grafting, or making divisions from existing stock.

### SOIL BINS

The soil bins store potting mix ingredients, including finished sifted compost, sand, a purchased base mix, and amendments such as peat moss and perlite. With these ingredients we are able to make custom soil mixes that we use in propagation.

### COMPOST ROW

We compost garden scraps and food scraps from the ESYB kitchen in a row of free-standing compost piles called Compost Row. The free-standing system allows students to comfortably stand around the compost and turn the piles together as a group. Students are able to observe the different stages of decomposition from pile to pile. In addition to our free-standing pile system, we also utilize some passive forms of decomposition such as a worm bin and a “no-fuss” pile. The no-fuss pile is a cylindrical wire frame that we fill with raked-up leaves. The leaves slowly decompose over time without turning.

### WORM BIN

The worm bins, located behind our outdoor kitchen, are wooden bins used for decomposing food scraps.

We intentionally have worm bins near our outdoor kitchen for easy access to composting food scraps. Here, students learn about the importance of worms as decomposers and harvest worm castings. Worm castings are incorporated into our soil mixes for propagation.

### **CHICKEN COOP**

In the Edible Schoolyard program, the presence of chickens and ducks has fostered a nurturing spirit within the student body and added tremendously to student buy-in, especially with students who might not otherwise be as interested in the garden. Garden teachers integrate “chicken time” into classes as much as possible and students are encouraged to check for eggs before school, during garden and kitchen classes, and after school. The capacity of the chicken coop in the Edible Schoolyard is about 30 birds. In addition to providing opportunities for learning about small-scale animal husbandry, garden eggs are often incorporated into kitchen classes, and garden teachers encourage students to move the chicken tractor—a small mobile coop that is used to concentrate beneficial chicken scratching, fertilization, and consumption of weeds and insects to garden beds as part of cultivating.

### **TOOL SHED**

All our garden tools and equipment live in the Tool Shed. Every tool has a clearly labeled home, and tools are stored on hooks or open shelves so that they are easily visible. In addition to the tool shed, tools are stored on mobile racks that are wheeled out in front of the tool shed each day, which allows more students access and prevents any congestion around choosing tools. Tools in the Tool Shed are marked with yellow tape while tools from the mobile racks have red tape, allowing students to put them back where they found them. Students independently choose and put away garden tools every class. The tool cleaning station is adjacent to the tool shed. After every garden class, students scrub their tools clean in barrels filled with linseed oil and sand. This is

a water-free way for students to clean and put away their tools, leaving things ready for the next class.

### **RAINWATER CATCHMENT SYSTEM**

The gutters on both sides of the tool shed connect to catchment tanks that allow us to capture hundreds of gallons of unchlorinated water every time it rains. Students learn here about water conservation and recycling. This system was made possible through a grant from the Alameda Countywide Clean Water Program.

### **WOOD-FIRED OVEN**

The wood-fired oven—built of stones, bricks, and mortar—provides a great way to incorporate cooking in the garden. We use the oven with students to roast potatoes, beets, and carrots, and make pizza. The oven is also used for schoolwide events.

### **OUTDOOR KITCHEN**

The outdoor kitchen provides a covered space with sinks in the garden, shielded from the sun and rain. The covered space is large enough for 10-12 students. Adjacent to the outdoor kitchen is our Long Table; students use this space to eat together the food that is prepared during garden class. Our outdoor kitchen is near a building that can supply us with electricity, which allows us to power our electric burners when making hot food. Students built a constructed wetland to receive the water from the sinks of the outdoor kitchen. We refer to this as our graywater basin. The plants in this wetland absorb and filter the graywater before it goes into the garden. Aside from cooking, we use the covered space for processing the harvest, preparing the tasting, making flower bouquets, afterschool class meet-ups, and any academic lessons that require a table.

### **POND**

The pond provides a calming place in the garden for students and teachers to enjoy while also adding a unique ecosystem to explore. Aquatic plants vegetate the pond and perimeter while a solar-powered

waterfall cascades into small pools that circulate the pond's water. Our ducks love playing and bathing in the pond. We stock fish in the pond to eat mosquito larvae.

### **BEEHIVE**

We use our top-bar beehive to teach students about the importance of pollinators and add to the overall fertility of the garden. The beehive is located on a secluded hillside in the back of the garden with a student-built fence surrounding it. Local beekeepers help us maintain the hive. We incorporate honey from the hive (when available) into our Bee Lesson, where students are given the opportunity to taste fresh honeycomb.

### **ORCHARDS**

We have two orchards in the garden: the Hillside Orchard, comprising about 30 fruit and nut trees,

and the Triangle Orchard, with nine stone fruit trees. The fruit from both is harvested and used in the kitchen classroom or garden lessons whenever possible. The Hillside Orchard is terraced, maintained and improved each year by students. It also has swales—ditches dug along the contour of a slope to collect rainwater on-site, thereby reducing the need to irrigate the orchards. The swales help prevent erosion and usually can store enough rainwater to the point of saturation, allowing the orchard trees to be less dependent on irrigation.

### **PERIMETER FENCE**

The perimeter fence is a 6-to-7-foot open-air metal mesh fence that keeps deer out of the garden without obstructing lines of sight. By keeping deer out, we are able to protect our crops from their nibbling mouths, and keep out any contaminants they may bring with them.

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# Tool Shed Contents

Working with tools is an essential aspect of every student's experience at the Edible Schoolyard.

Students are introduced to tool safety in their classrooms before they come out to the garden, and then they are given a tool shed orientation during their first garden class. Below is a list of tools we find essential to run a successful garden program, along with a list of optional tools we find useful to run a large middle school (or high school to adult) program. Choose the tools from the optional list that will be best suited to your program.

## Essentials in the ESY Tool Shed

- ▶ Hand-cultivation tools like trowels
- ▶ Rakes (T and fan)
- ▶ Spaded forks
- ▶ Shovels (flat, round, snow)
- ▶ Clippers
- ▶ Loppers
- ▶ Gloves
- ▶ Harvesting baskets and crates
- ▶ Buckets
- ▶ Sturdy wheelbarrows
- ▶ Broom
- ▶ Hoses
- ▶ Watering cans
- ▶ Trashcan with lid
- ▶ Saws (pruning, bamboo, grass, and carpentry)
- ▶ Basic carpentry/plumbing tools (hammers, pliers, wrenches, screwdrivers)
- ▶ Basic carpentry/plumbing hardware (nails, screws, nuts, bolts, tape, staples, replacement fittings, valves, heads, etc.)
- ▶ Wire
- ▶ Twine and rope
- ▶ Wooden stakes
- ▶ Organic soil amendments (rockdust, feather meal, kelp meal, oyster shell)
- ▶ Bamboo (for structures, trellising, fencing, stakes)

## Optional

- ▶ Pitchforks
- ▶ Hoes
- ▶ Sledgehammers
- ▶ Pick axes
- ▶ Fence post pounder
- ▶ Sprinklers
- ▶ Watering wands
- ▶ Egg baskets
- ▶ Compost thermometer
- ▶ Greenhouse aprons
- ▶ Crowbar
- ▶ Sunscreen
- ▶ Pads (for seating on wet days)
- ▶ Ponchos or rain jackets
- ▶ Rubber boots
- ▶ Screens (for winnowing amaranth and other grains)
- ▶ Bowls (for seed saving, winnowing)
- ▶ Wire brushes
- ▶ Plastic scrapers
- ▶ Linseed oil (to be added to sand for tool cleaning)
- ▶ Liquid Fence (deer repellent)
- ▶ Backpack sprayer (for foliar feeding)
- ▶ Mower
- ▶ Weed whacker
- ▶ Rototiller
- ▶ Gasoline
- ▶ Ladders (including tripod orchard ladder for harvesting/pruning fruit trees)
- ▶ Large umbrellas with stands

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# A Typical Garden Class

## “Typical” No More

Until 2015, a typical garden class at the Edible Schoolyard followed the same format for all three grades: Students came to the garden for approximately 90-minute periods about once a week for three-to-eight-week rotations. In 2015, King adopted a new class schedule for seventh and eighth graders that changed the typical weekly layout for how often and for how long we could see these students in the garden. In order to maximize time with students under the new schedule, we developed an entirely new format for seventh- and eighth-grade garden curriculum called “Immersion Weeks.” In Immersion Weeks, students come to the garden with their science class every day for one week. We still use the more traditional format in our sixth-grade lessons. Below, we first outline a typical garden class with sixth graders, and then a typical “Immersion Week” format we use with seventh and eighth graders. In both formats, every garden class integrates a common set of rituals and routines. This allows students to know both what to expect and what is expected of them every time they come to the garden.

## A Typical Sixth-Grade Garden Class

A typical garden class with sixth graders at the Edible Schoolyard is 86 minutes (1 hour and 26 minutes) and is divided into three main parts: Opening Circle, In the Field (work time), and Closing Circle.

### 1. OPENING CIRCLE (7-12 MINUTES)

- ▶ A typical garden class begins in the Ramada with an Opening Circle. At the Opening Circle, we welcome students and frame the garden class. Garden teachers rotate the role of facilitating circle.
- ▶ Introduce the day’s activity or lesson.
- ▶ Focus attention to the job board and model team-teaching.
  - ▶ From their seat in the circle, each garden teacher gives a brief description of the garden job they will be teaching. Describing garden jobs inspires student buy-in by allowing students to make an informed choice for the garden job that interests them the most.

- ▶ Introduce the closing circle activity so that students are prepared upon returning to circle at the end of class.

- ▶ Divide into working groups.

### 2. IN THE FIELD (40-60 MINUTES)

- ▶ After Opening Circle, students break up into three or four working groups. Each group has an average of 6-10 students and one garden teacher. Occasionally a classroom teacher will also lead a working group. Working groups walk from the Ramada to their job site.
- ▶ Lead a small-group check-in: Have each student answer a check-in question. Check-in questions should be fun, interesting, easy to answer briefly, and answerable by all. They may or may not have anything to do with gardening or the lesson theme. The goal of a check-in is to hear everyone’s voice.
- ▶ Review the garden job: Break down the steps to executing the garden job and have students identify the necessary tools before going to tool

shed. This is an excellent time to introduce specific inquiry questions or other frames that help to connect the garden activity to other lesson themes or content.

- ▶ Get the necessary tools and gear from the toolshed: We aim to cultivate a sense of independence and ownership with our students over the garden space. Students are responsible (with support, if necessary) to identify what tools they need and get them from the tool shed. We rarely have tools set out for them at the beginning of class. This is also the opportunity for students to grab any gloves, work boots, aprons, knee pads, and ponchos that they wish to use. We make this type of protective gear available to all students for every lesson to eliminate barriers to participation—we never want a student to feel as if they have to sacrifice the cleanliness or dryness of their shoes or clothes in order to participate in our class if maintaining these things is a priority for them.
- ▶ Work together on the garden job. Our most common garden jobs are:
  - ▶ Composting (e.g., building a new pile or turning an old one; sifting fresh compost; harvesting worm castings)
  - ▶ Cultivating (e.g., preparing a bed for planting; building a new bed; pulling out crops; chopping and turning a cover crop, etc.)
  - ▶ Harvesting (e.g., harvesting produce to be used in a kitchen lesson or Family Night Out evening class; preparing or cooking a tasting for Closing Circle; making flower bouquets for students to bring home or for decorating the kitchen classroom; harvesting herbs to dry for tea or flowers to dry for an art project, etc.)
  - ▶ Propagating (e.g., direct sowing in the garden; sowing or upsizing in the greenhouse; transplanting from the greenhouse to the garden; grafting; working with cuttings; making soil mixes for plant starts, etc.)
  - ▶ Caring for garden infrastructure (e.g.,

constructing and deconstructing trellises and fences in the garden, mulching pathways, painting signs for crops, etc.)

- ▶ Visit a lab or breakout session: Many of our lessons that focus on specific scientific concepts—as opposed to broader cross-cutting concepts and practices that students develop every time they visit the garden—include a lab or breakout session that work groups rotate through during the work period. One example is the greenhouse lab, in which each working group takes a turn in the 50-minute work period to visit the greenhouse and experience the 10-minute lab. Other times, labs like “Biology of Flower” may take the full working period, in which a class will experience them over the course of three to five weeks with a new group of 6 to 10 students engaging in the lab each week until every student in the class has experienced it.
- ▶ Foraging breaks and exploration time: We love to include impromptu foraging breaks and free exploration time both during and after our garden job work time whenever time allows. We intentionally grow a variety of crops that ripen at different times of year and are easy and delicious to enjoy straight from the plant—some of our students’ favorites include mulberries, loquats, raspberries, ground cherries, figs, pineapple guavas, sorrel, sugar snap peas, carrots, and celery. Open-ended exploration in the garden sparks student curiosity, inspires student buy-in, and provides invaluable opportunities for students to practice and develop their observation and inquiry skills. During this time we encourage appropriate play such as wheelbarrow rides, with the understanding that a certain amount of risk in play is beneficial.
- ▶ Clean and put tools away: Just as important as knowing which tools to use and how to use them are knowing how to properly care for them. From their first time in the garden, students learn how to clean shovels and forks off in the buckets of mixed sand and linseed oil next to the tool shed.

### 3. CLOSING CIRCLE (10-15 MINUTES)

At the end of the working period, teachers ring a cowbell to signal to students that it is time to finish cleaning up and gather back at the Ramada for the Closing Circle. We use closing circles in the garden as a time for students to share with the other working groups what they worked on, reflect on their learning or experience, and often enjoy some fresh food from the garden in a tasting.

- ▶ **Tastings:** Tastings are the most common closing circle activity. Whenever we do tastings, one working group will spend time during the work time to prepare the tasting. They will harvest a seasonal fruit, vegetable, or herb from the garden (some examples are apples, oranges, kiwi, soft herbs, turnips, radishes, carrots, sorrel, kale), and then prepare and arrange the food beautifully. In a tasting, the working group that prepared the tasting will pass it out to all the students. We wait until everyone has been served to taste, encouraging students to use their other senses while they wait to enjoy what they are about to eat. After we have all eaten, each student takes a turn to share their name, and, depending on their grade level, either an observation or a simile related to the tasting.
  - ▶ **Sixth grade:** Students draw on their five senses to make an observation about the fruit or vegetable that they tasted (e.g., “My name is \_\_\_\_\_ and my apple tasted sweet”).
  - ▶ **Seventh and eighth grade:** Students draw on their five senses to create a simile about the tasting (e.g., “My name is \_\_\_\_\_ and my apple tasted sweet like honey”).
- ▶ **Report Backs:** In a Report Back, one or more representatives from each working group shares a description of their garden job, including any progress they made during the period and how the garden job contributes to the garden at large (e.g., “We finished cultivating the bed and it is ready to plant the cilantro starts from the greenhouse”).

## Garden Immersion Weeks

In an Immersion Week, students come to the garden every day for a week. Our seventh-grade classes come for two weeks of immersion, one in each semester. Eighth-grade classes come for one week in the spring. Classes last 45 minutes to an hour on Monday, Tuesday, and Wednesday, and about 90 minutes on Thursday and Friday.

### GARDEN TRACKS

Distinct from our typical sixth-grade lessons in which students choose from a variety of garden jobs as part of Opening Circle, in Immersion Weeks students choose one “track” to follow for the entire week even before they come to the garden. Each garden teacher designs a track based on their own interests, specializations, and the needs of the garden. In some cases, all the tracks will follow variations on a single overarching theme that connects to students’ academic learning. For example, in the first seventh-grade rotation, each track explored some facet of ecosystems. Immersion weeks are also an excellent opportunity to engage in project-based learning—many of our tracks culminate in a tangible goal.

### SELECTING TRACKS

In the weeks before students are scheduled to come to the garden, garden teachers visit students’ science classrooms to present descriptions of each track option. Students then have the opportunity to indicate their personal preferences for which track they follow by ranking the options from top to least favorite. The voting process gives choice and flexibility to the students, which helps to inspire buy-in and set up the dynamics of the groups for success. Below is an example of a voting ballot we used for one seventh-grade immersion:



Name: \_\_\_\_\_ Teacher: \_\_\_\_\_ Period: \_\_\_\_\_

After each option below, please circle if it is your 1st, 2nd, 3rd, or 4th choice.

(You can only have one 1st choice, one 2nd choice, etc.)

**All About Chickens:**      **1st**   **2nd**   **3rd**   **4th**  
(with Ms. Rachel)

**Climate Change:**      **1st**   **2nd**   **3rd**   **4th**  
(with Mr. Geoff)

**Gardening & Cooking:**   **1st**   **2nd**   **3rd**   **4th**  
(with Mr. Jason)

**Mini-Habitats:**      **1st**   **2nd**   **3rd**   **4th**  
(with Ms. Tanya)

Thank you! We will do our best to place you in one of your top choices.

## Immersion in the Garden

### 1. OPENING CIRCLE (5-8 MINUTES)

Just like our typical sixth-grade garden class, the first lesson of the week begins with an Opening Circle (thereafter students meet with their track groups in a designated spot). We use the Opening Circle to welcome students and frame the week. Garden teachers rotate the role of facilitating opening circle.

- ▶ Introduce the week's immersion tracks. Remind students that they voted for their tracks beforehand and the garden teachers did their best to give students their first or second choice.
- ▶ Answer questions about how the week will run, reminding students that they will not meet in their classroom for the remainder of the week, but will meet at a designated spot identified by their group leader.
- ▶ Divide into track groups.

### 2. IN THE FIELD

(MON.-WED. AVERAGE OF 45 MINUTES,  
THURS. OR FRI. 90 MINUTES)

After opening circle, students break up into their track groups. Each group has an average of 6-8 students and one garden teacher.

- ▶ Check-in question and review of the week and the goals.
- ▶ On the first day, a meet-up spot in the garden is identified for the rest of the week.
- ▶ Each track group works on their goals and projects for the week.

### 3. CLOSING CIRCLE

(LAST 20 MINUTES OF THE FINAL DAY,  
EITHER THURSDAY OR FRIDAY)

Immersion Weeks culminate in a Closing Circle. One group prepares a tasting, which tends to be more substantial and elaborate than the tastings in our sixth-grade classes—kale pesto on bread, salad wraps with fava bean puree, and oven-roasted carrots and beets are some of our favorites. The tasting serves as the centerpiece of the Closing Circle as groups have the opportunity to reflect and share with one another their experiences and successes from the week.

- ▶ The tasting is introduced and served in the Ramada. Students wait to eat until everyone has been served.
- ▶ Groups report back after the tasting. Each group has the opportunity to share thoughts, stories, successes, and learning from the week.
- ▶ We open the floor for appreciations and shout-outs, if time permits.



# Edible Schoolyard Garden Immersion Week

## Summary

The Edible Schoolyard Immersion week was developed in 2015 when King Middle School adopted a new seventh- and eighth-grade class schedule, which changed our typical weekly layout of how often and for how long we could see students in the garden. In order to maximize our time with students, we needed to be flexible, so we piloted a new structure of seeing the students every day for a week, rather than once a week over a three-to-eight-week period.

- ▶ The Edible Schoolyard Garden Immersion week was developed so that each science class from the seventh and eighth grade could have a full week of daily garden programming.
  - ▶ The seventh-grade classes receive two weeks of immersion, one in each semester.
  - ▶ The eighth-grade classes receive one week in the spring rotation.
- ▶ Prior to their garden week, students are presented with track descriptions in their classroom and are asked to rank their choices from most to least desire.
- ▶ The track groups work with an individual garden teacher for the duration of the immersion week, creating and achieving their own group goals.

## TRACK DESCRIPTIONS

Each garden teacher creates a track based on their interests and specialization. Tracks also incorporate the needs of the garden for that season.

- ▶ In some cases, tracks have an overarching theme for the week, where each track makes an attempt to include activities that relate to the theme.

- ▶ The overarching theme helps to connect the students' garden experience to academic standards.
- ▶ In the first rotation for the seventh graders, our theme was ecosystems.
- ▶ Examples of the tracks are shown in the Scope and Sequence take homes and help to illustrate all the standards being covered.

## VOTING PROCESS

We use a voting process to give students choice and flexibility. It also helps achieve student buy-in while setting up the groups for success. Here is an example of a voting ballot we used for a seventh-grade immersion:

Name: \_\_\_\_\_ Teacher: \_\_\_\_\_ Period: \_\_\_\_

After each option below, please circle if it is your 1st, 2nd, 3rd, or 4th choice.

(You can only have one 1st choice, one 2nd choice, etc.)

**All About Chickens:**            **1st**    **2nd**    **3rd**    **4th**  
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**Mini-Habitats:**                **1st**    **2nd**    **3rd**    **4th**  
(with Ms. Tanya)

Thank you! We will do our best to place you in one of your top choices.

# Sample Class Structure for Immersion Week

## 1. OPENING CIRCLE (5-8 MINUTES)

We use the opening circle to welcome the students and frame the class. Garden teachers rotate the role of facilitator.

- ▶ Introduce the week's immersion tracks. Remind students that they voted for their tracks beforehand and the garden teachers did their best to give students their first or second choice.
- ▶ Answer questions about how the week will run, reminding students that they will not meet in their classroom for the remainder of the week, but will meet at a designated spot identified by their group leader.
- ▶ Divide into track groups.

## 2. IN THE FIELD

(MON.-WED. AVERAGE OF 45 MINUTES,  
THURS. OR FRI. 90 MINUTES)

After opening circle, students break up into their track groups. Each group has six to eight students and one garden teacher.

- ▶ Check-in question and review of the week and the goals.
- ▶ Meet-up spot in the garden is identified for the week.
- ▶ Each track group works on their goals and projects for the week, integrating student buy-in, when possible.

## 3. CLOSING CIRCLE

(LAST 20 MINUTES OF THEIR FINAL DAY,  
EITHER THURSDAY OR FRIDAY)

For the immersion weeks, our closing circles are designed as a culminating process. The tasting is prepared by one of the track groups, and it usually consists of a prepared snack. Some of the prepared tastings we've done are kale pesto on bread and salad wraps with fava bean puree or beets.

- ▶ The tasting is introduced and served in the Ramada. The same protocol is observed, where students wait to eat until everyone is served.
- ▶ Report backs are done after the tasting. Each group has the opportunity to share about their week.
- ▶ Appreciations and shout-outs are done, if time permits.