



GROWING GARDENS

GROWING GARDENS Youth Grow Garden Lesson Manual



About Growing Gardens

Growing Gardens gets at the root of hunger in Portland, Oregon. We organize hundreds of volunteers to build organic, raised bed vegetable gardens in backyards, front yards, side yards and even on balconies. We support low income households for three years with seeds, plants, classes, mentors and more. Our Youth Grow after school Garden Clubs grow the next generation of veggie eaters and growers! Through Learn & Grow workshops and work parties, we teach gardeners all about growing, preparing and preserving healthful food while respecting the health of the environment.

We plant seeds for good food and healthy people by making sure low income people have the resources they need to grow organic vegetables at home. Through this work, community members meet over the backyard garden, through volunteering, by attending classes, and through sharing extra produce.

Mission and Values

Growing Gardens promotes home-scale organic food gardening to improve nutrition, health and self-reliance while enhancing the quality of life and the environment for individuals and communities in Portland, Oregon. We believe:

- Access to healthful, culturally appropriate food is an inherent right.
- Individuals and communities are empowered when they have the knowledge and skills to provide food.
- All people deserve recognition and respect for their unique value.
- Joy and fun are essential elements in any activity we host, promote, or undertake.
- Trust, honesty, open-mindedness and accountability are core elements in all we do.
- Quality of life is improved when we respect and honor our environment and when we promote the interconnection of all things.

About Youth Grow

Growing Gardens **Youth Grow Program** empowers low-income elementary school children with lifelong skills growing food and eating healthfully in a way that protects the earth. Children develop knowledge of organic gardening techniques, nutrition and healthy behaviors in the living laboratory of the garden. Our unique three-year school partnerships build the capacity of a school community to lead and sustain garden-based educational programs at their sites. Youth Grow After-School Garden Club is designed to help reduce risk factors for low income students and create the foundation for self-reliance that lasts a lifetime.

Program Rationale

According to the United States Department of Agriculture (USDA) Oregon citizens are at high risk to experience food insecurity (uncertainty about where the next meal is coming from). One out of every eight Oregonians experiences food insecurity at some time during the year. Children who are hungry or poorly nourished do less well in school, both academically and behaviorally. "Lower socioeconomic status in childhood has been linked repeatedly with lower educational and income levels in adulthood, which in turn predict health status. Children in poor families are about seven times as likely to be in poor or fair health as children in the highest-income families."¹ A study in 2005 revealed 25% of Oregon's eighth and eleventh grade students are at risk for becoming overweight or obese, putting them at risk to develop chronic disease such as diabetes, hypertension and cancer. Given these alarming trends, it is expected that for the first time ever, the next generation of Oregonians will have shorter life spans than their parents.

At our Youth Grow Partner Schools, we offer eight-week Garden Clubs after-school, as well as Garden Summer Camps. Hands-on food gardening activities are a very effective way to influence students' attitudes and preferences toward fruit and vegetable consumption.² We target elementary aged-children because it is documented that eating habits and preferences are established early in life and studies show that if established before 6th grade, positive habits are more likely to persist into adulthood. Studies show that when children have a *hand in growing food, their understanding of food and relationship to their health increases.*

Garden club is also a fun, interactive way for students to:

- Increase knowledge of organic gardening and safe use of hand tools
- Increase opportunities for physical activity
- Learn life skills such as teamwork, patience, and cooperation.

School Garden Coordinator Certificate Training

Successful long-lasting school garden programs involve more than just digging in the soil - from yearly maintenance tasks to communicating among garden users.

¹ Unnatural Causes Backgrounder, California Newsreel, 2008

² McAleese, et al. Garden Based Nutrition Education Affects Fruit and Vegetable Consumption in Sixth-Grade Adolescents. Journal of the American Dietetic Association, Volume 107, Issue 4, April 2007, pages 662-665



Growing Gardens offers a 35 hour School Garden Coordinator Certificate Training in order to help people facilitate the creation of long-lasting edible school garden programs based on broad-based community support. During this course, local experts share best practices in: a) community engagement and partnership; b) garden program development and implementation; c) principles of youth garden education that are linked to education standards; and d) school garden program evaluation. Peer-networking and field trips to learning garden sites expose students to diverse programs and communities. For more information about this course go to www.growing-gardens.org

Contents

1. Introduction and Overview

2. Working with Students in the Garden

- Classroom Management Techniques
- Peaceful Conflict Resolution
- Addressing Disruptive Behaviors
- Making Garden Club Accessible for All Students
- The Youth Grow Garden Club Structure
- Food Safety and Handling
- Evaluation

3. Lessons

Lesson I: Introduction to the Garden

Lesson II: Parts of the Plant

Lesson III: Seeds and Seed Dispersal

Lesson IV: Flowers and Pollinators

Lesson V: Bugs and Insects

Lesson VI: Soil and Compost

Lesson VII: Wondrous Worms

Lesson VIII: Celebration

4. Bibliography

5. Appendices

- Appendix I: Garden and Food Related Children's Books
- Appendix II: Garden Based Curriculum Resources
- Appendix III: Gardening Resources

1. Introduction and Overview



This manual contains a series of eight garden-focused lessons, developed by Growing Gardens' Youth Grow Program. These lessons have been shaped and informed by the work of other garden educators and programs, and we have adapted many activities, lessons, and concepts to fit within the structure of our program. Our eight lessons introduce students to a broad range of garden topics, teach students how to grow food using organic methods, and expose them to tasting different fruits and vegetables. The activities give students the opportunity to improve skills in scientific investigation, teamwork, and leadership, as well as writing, drawing, and reflection. The manual is intended to be used by garden educators, parents, and teachers. The eight lessons are flexible in terms of required resources, materials, and physical garden spaces. Within the lessons, we include activities for younger students (K-2nd grade) and older students (3rd - 5th grade) to be used as part of after-school Garden Clubs/programs. We also provide instructions for supplemental activities, and as well as recommendations for additional resources, children's books, and other gardening materials.

School gardens can play a vital role in educating the next generation about where food comes from, and the importance of eating fruits and veggies. They can provide students with hands-on experiences and skills that can improve their future health and food security. Gardens are living classrooms that can provide a place for students to reconnect to the world around them. They offer students a place to explore the diverse plants, soil microorganisms, bugs, and insects that live right outside the school doors. In a time when the health and wellness of children is of increasing concern, school gardens can be a valuable tool in working to decrease childhood obesity rates, while improving mental, physical, and social health. Garden education helps the next generation understand and respect the importance of a healthy and sustainable food system. We hope that

these lessons will help inspire educators, parents, and community members to help create future and lifelong vegetable eaters and growers!

Overview of Lessons:

- I. **Introduction to the Garden:** Highlights gardening basics, including: planting seeds and plant starts, using tools safely and correctly, and understanding garden rules. Students investigate the garden using a scavenger hunt and plant seeds either indoors or outdoors to watch them grow throughout the term. Students taste a new fruit or vegetable.
- II. **Parts of the Plant:** Students learn about the six different parts of the plant by acting out plant life cycles and using all of their senses. Students discover which parts of the plant we eat, what plants need to grow, and how the fruits and vegetables we eat relate to the plant life cycle. Students taste all six parts of the plant in one bite, in a “plant part wrap”
- III. **Seeds and Seed Dispersal:** Students explore what seeds need to sprout, and how seeds move around in the world by wind, water, and animals. Students explore the different types of seeds found in the garden, plant life cycles, why seeds are important for wildlife, and how we can save seeds from fruits and vegetables we eat. Students also learn about how seeds can be used in different foods, and taste seeds.
- IV. **Flowers and Pollinators:** Students investigate the structure of flowers and discover the importance of flowers and pollination in growing fruits and vegetables. Students discover how bees, butterflies, and other pollinators distribute pollen to other flowers and how flowers attract pollinators. Students also learn about the flowers we use as food and taste edible flowers, such as nasturtiums, broccoli, or cauliflower.
- V. **Bugs and Insects:** Through a garden investigation, an introduction to insect anatomy, and a game highlighting the role of beneficial insects, students learn about the importance of bugs and insects in establishing a healthy food garden, and how garden “pests” can be controlled without using chemicals that could harm the soil and the environment. Students create and eat “edible insects” made from fruit and vegetables.
- VI. **Soil and Compost:** Highlights the composition of soil and the role soil plays in the garden to grow healthy food. Through activities and games, students investigate what soil is made of, learn different methods of composting and the importance of waste reduction, and learn about the microorganisms in the soil that play a valuable role in food production. Students taste a root vegetable, grown directly in the soil.
- VII. **Wondrous Worms:** Students learn and explore worm anatomy and habitat using a worm bin. Students apply their knowledge by investigating outdoor garden spaces for the presence of worms, and learn about the role of decomposition in the web of life through art activities and a tag game. Students taste a fruit or vegetable harvested from the garden.

VIII. **Celebration:** Review and celebration of what was learned in the eight weeks of Garden Club. The lesson includes “Garden Jeopardy” a fun way to review garden topics, as well as a chance for the class to pick a favorite garden game to play. Students taste a special snack for the last day, possibly a rainbow smoothie or kiwi parfait (recipes included).

2. Working with Students in the Garden



A school garden provides a unique opportunity for students, teachers, volunteers, and parents to engage with an outdoor space in the context of school. This opportunity does not come without some challenges. In our **Youth Grow Program** we strive to create a safe learning environment for students in the garden, which means preparing our students (and volunteers) for specific safety considerations. These considerations include:

1. First, we ask students to be respectful of each other, teachers, volunteers, and the garden space (including the critters that live there). This means using appropriate and respectful language, listening when others are speaking, paying attention to educators/volunteers and following activity instructions, asking before harvesting fruits, vegetables, or flowers, and keeping hands and tools to oneself.
2. It is also important to create and articulate boundaries to students. We ask students to stay with the group and within sight. It is extremely important students understand how to safely move and gather in the garden, and educators should provide clear guidelines to students early in their experience in the garden.
3. We regularly remind students to use “walking feet” in the garden. We make sure students understand the importance of walking in the garden for their own safety, as well as the safety of the plants and the garden beds.
4. Whenever we need to use tools in the garden, we show students how to use tools in a safe way. This includes creating clear rules about the tools before beginning to use them in the garden (such as keeping the tool

- below your waist, not leaving tools laying on the ground and putting them away when finished, and watching where you're digging/hoeing/weeding).
5. We also find it helpful to create visual demonstrations and reminders of appropriate practices in the garden, including signs or kiosks with garden rules, plant labels and pictures, etc. If the paths in the garden are unclear or overgrown, it is important to make sure students understand where to walk through the garden without compacting garden soil or damaging plants.
 6. We encourage students to wear closed toed shoes, and weather appropriate clothing, including rain coats and boots, sunscreen, and to drink lots of water in the summer. For sites where students do not have access to appropriate clothing, we try to provide extra coats and boots in the winter time.

In addition to safety considerations, we also expect our students to follow the school rules, which are often tied to being respectful, responsible, and safe. During the first day of class, we regularly ask students what they think the rules of the Garden Club should be, and ask them questions about additional safety concerns that may be relevant in the garden. This helps engage the students in the rule making process, and also encourages buy-in to the rules down the road.

Classroom Management Techniques

Working with students outside in the garden provides different classroom management opportunities and challenges than teaching indoors. Garden activities are well suited for students strong in kinesthetic and visual learning styles, and give many students an opportunity to shine or highlight skills and strengths in the outside environment. Yet, this opportunity for a change of scenery can also lead some students to push boundaries, making strong classroom management vital for creating the most effective experience for students in the garden.

Below we offer some general advice that has worked well for us in our after-school Garden Clubs. Keep in mind, however, that each school and each class is different, and it is important to understand the policies and procedures used at a particular school site in addressing student behavior.

Addressing Disruptive Behavior

1. If two children are sitting/standing next to each other and disrupting class, go sit/stand between them and quietly remind them that they have agreed to the Garden Club rules of respecting each other and thus need to show respect for whoever is speaking by listening to what the speaker has to say.

2. If the behavior continues, ask the student(s) who are involved to step out into the hall (or outside the garden) with you to discuss it. Use the outline below to determine what the children are feeling and give them a choice between making a commitment to participate responsibly or sitting out for the rest of the class.
3. If they choose to sit out, explain that we expect them to be respectful of the rest of the class by not disrupting the class activity. Once they have decided that they are ready to participate, they are welcome to rejoin the group.
4. If the same child causes another disruption after they have rejoined the group, speak with them and ask them what they are feeling. Acknowledge their feelings but explain that it is not respectful to their classmates to continue causing a disruption and that they will need to take a mandatory break from the class by sitting quietly for 3-5 minutes.
5. If the same child again causes a disturbance, explain to them that you will be writing them a referral/yellow card and that they will need to sit out for the remainder of the class. If they cannot do that without causing a disruption, they will need to go to the after-school program office or main office for the remainder of the class.

Referral Systems

In our experience, school sites vary in terms of referral systems. In general:

1. If you see any child physically assaulting another child, immediately address the situation, attempt to resolve the conflict, and explain that, no matter what, it is not okay to be violent with anyone else. In many cases, you may also need to write a referral for them regarding their actions (school specific guidelines apply for this process).
2. If inappropriate language is used with malicious intent, use the same procedure as described above.

At some of school sites, if a child receives three referrals, that student will no longer be able to participate in the after-school program. Each site has its own referral/discipline system, be sure you know what the system is and follow it to the best of your ability.

Positive Solutions for Educators Dealing with Difficult Behavior from Students

In our experience working with students, we have found the following chart from *Positive Discipline Fundamentals* extremely valuable in thinking about how to effectively address behavioral issues with students in the garden.

Student behavior	This behavior can invoke adult to feel:	Reasons why student may act this way	Positive solutions for dealing with this behavior
Needs constant attention	Annoyed, irritated, worried, guilty	Feels they belong only when being noticed or getting special attention. Feels they are only important when keeping you busy with them. Really saying notice me-involve me.	Redirect by involving student in a useful task. Send the message I care about you, and I will spend time with you later. Avoid special service. Say it only once, then act. Plan special time. Set up routines. Set up non-verbal signals (wink, wave etc).
Bossy	Provoked, challenged, threatened, defeated	Feels they belong only when in control. Needs to prove that no one can boss them or 'make them' do anything. Really saying let me help-give me choices.	Acknowledge that you can't make him/her do the task, and ask for his/her help. Offer a limited choice. Withdraw from conflict and calm down. Be firm and kind. Act, don't talk. Decide what you will do. Let routines be the boss. Get help from student to set a few reasonable limits. Follow through on agreement. Redirect to positive power.
Revengeful	Hurt, disappointed, disbelieving, disgusted	Doesn't think they belong so they try to hurt others. Feels they can't be liked or loved. Really saying I'm hurting – validate my feelings.	Deal with the hurt feelings; Your behavior tells me you must feel hurt. Can we talk about it? Use reflective listening. Don't take behavior personally. Share your feelings. Apologize. Avoid punishment and retaliation. Show you care. Encourage strengths.
Gives up and/or wants to be left alone	Despair, hopeless, helpless, inadequate	Doesn't believe they can belong so they try to convince others not to expect anything from them. Feels helpless and incapable. Really saying don't give up on me-show me a small step.	Make the task easier until the child succeeds. Show faith. Encourage any positive attempt, no matter how small. Build on his/her interests. Encourage, encourage, encourage!

Adapted from *Positive Discipline Fundamentals*, page 12-13

Procedures and Peaceful Conflict Resolution Guidelines

As much as possible we like to help our student peacefully resolve conflicts. Below is a basic outline for conflict resolution that, in ideal situations, we like to use with our students. In many ways, using this outline may be unrealistic given the typical length/requirements of our classes, but we think it is valuable to understand how to help students work through conflicts if enough time and resources are available. Our main concern is to make sure students are safe and comfortable. Do your best!

Practical Steps for Conflict Resolution:

Your focus should be to allow the students a safe time and place (away from other students) in which they have an opportunity to come to a better understanding of the other person and solve a conflict themselves with your careful mediation.

1. You see two or more children having a conflict or causing a disturbance to the rest of the group.
2. Approach the group and ask everyone who is involved in the conflict to step into the hall (or outside of the garden) with you to discuss the situation.
3. Explain that each child will have a time to speak and that they should show respect to the others by listening to the speaker when it is not their turn to speak.
4. Ask each child to please explain to you and the others what happened, how that made them feel, and why they feel the conflict began (what is the unmet need).
5. Allow each child a few minutes to speak- listen carefully to what each child is saying to try to identify their feelings and needs.
6. Ask questions to clarify what each child is feeling and what they need. Restate those feelings in an empathetic, non-judgmental way. Be careful not to pass judgment or express sympathy for any particular party. Often adults will reward the victim by their words and actions which reinforces harmful behavior patterns.
7. Ask each student to offer an idea they have of how this conflict can be resolved-encourage them to make a specific request of the other student that expresses their unmet need.
8. Ask each student to talk about whether they are willing to meet the other's request. Encourage them to work out how they can both have their needs met.
9. Avoid forcing the children to say, "I'm sorry" to the other. If your conversation has gone well, all students will likely have already expressed their remorse in some way as they have been able to empathize with the other student(s) feelings.

From Youth Grow Volunteer Rachel Koeson



Including all Students in Garden Club Activities

Garden Club should be accessible to students at all of levels, in terms of reading, writing, physical abilities, and language skills. Since this curriculum is intended for students in grades K-2nd as well as 3rd-5th, all of the activities are adaptable for non-reading students. In addition, you may have a group that is primarily English Language Learners, or students with physical or developmental disabilities. There are many ways to adapt the Garden Club lessons to work for any student. It is important to get to know the students in your group, and work to make the lessons accessible for all students.

Non-Readers and English Language Learners:

Use pictures as well as text when talking about a term or giving directions. Students who don't read or write can participate in activities through telling and listening to stories, singing songs, and hands-on exploration activities. Many of the activities in this manual give students the chance to learn by physically interacting with their environment and each other without reading or writing, and when they are part of the lesson, partnering youth with other youth may provide more support to those who are preliterate.

Immigrant and refugee youth in Garden Clubs have special language and culture challenges because they are learning about the world through even more "lenses" than their peers. You can build their confidence by encouraging youth to demonstrate their knowledge and skills in their native language or through pictures and descriptions. Songs and games that allow them multiple chances to "try" new language with a group can be especially successful and create a safe, fun environment. Language learners may also experience a "silent period" where they are assimilating and organizing language input without saying much of anything. Showing through gestures that youth are welcome and included in activities and avoiding situations where they are "on the spot" to say or interpret something quickly in English will allow them the space they need to feel comfortable and still give them the chance to maximize the benefit they get from the program.

Students with Physical and Developmental Limitations:

It is vital to make garden programs accessible to children with all levels of physical and developmental abilities. Get to know the youth you are working with, and work with school day staff to learn how best to accommodate students if necessary. If a student has physical limitations, take the necessary steps to adapt activities so they can participate fully. Feel free to ask youth what they are comfortable participating in, and do not assume that a disability means youth cannot be physically active. There are gardening activities appropriate for youth of all ability levels. For more information about including students of all abilities, visit Kids Included Together, at <http://www.kitonline.org/>.

When planning your garden space initially, consider including at least one Disabled Accessible (DA) raised bed. These beds are taller than a typical raised bed, and provide a ledge which can also be used as a seat for individuals who use a wheelchair. The Growing Gardens Home Gardens program builds DA beds that are 4x8x4. These beds are simple to construct and useful for people of all levels of physical ability, as they can also be used by those who are more comfortable standing. Check out Appendix III for more information about building accessible raised beds.

Youth Grow Garden Club Structure

Youth Grow Garden Clubs vary slightly depending on each school site and their after school program procedures. Once we begin working with students in the classroom and in the garden, however, we try to follow the same routine for each class. Routine helps students feel comfortable and secure. Here is a sample Garden Club schedule. Adapt the schedule to meet your specific needs.

1. Meet students/take attendance
2. Have them walk quietly to the room or garden
3. Ask students to set down their jackets, backpacks, etc, in the same place each week.
4. Have students sit in a circle, or move chairs to face each other in a circle.
5. Welcome everyone; make any introductions of new students/volunteers if necessary.
6. Go over rules and expectations.
7. Prepare agenda in advance, and go over agenda with students.
8. Ask a check in question (example: what are you most excited about today's class? Or check-in about what students' remember from the previous class)
9. Begin inside or outside activities. Prepare materials/tools, etc before class to ease the process and make sure to provide students with clear instructions and examples of how to complete the activity/garden task.
10. Work with students to complete activities, games, etc.
11. Clean up. In our experience, we are often working in classrooms used during the day by teachers. We make sure to leave the classroom at least as clean as we found it. This keeps teachers (and custodians) supportive of garden programs at the school.
12. Wash hands (20 seconds with warm soapy water or use hand-sanitizer).
13. Sit back in a circle: Introduce new fruit/veggie tasting & pass out.
14. Wrap up class. Give time for students to debrief or to gather any daily feedback information.
15. Hand out any materials to go home.
16. Closing

Food Handling and Safety

One important aspect of our program is to give students the opportunity to taste new fruits and veggies, either plain, or as part of a vegetable or fruit-based recipe. Each school district or program may have different policies regarding handling both fruits and vegetables from outside sources, as well as items grown in the garden. It is a good practice to make sure each garden educator has a Food Handlers License, which is available online for a small fee. See Appendix III for more resources on safe food handling in the garden setting, as well as the website for getting a Food Handlers License. Make sure you ask about and understand and follow the policies at your particular school site!

Harvesting

All involved in harvesting should wash hands thoroughly in warm soapy water for at least 20 seconds before harvesting. All harvesting tools (scissors, bowls, etc) should be food service approved. Clean tools regularly with hot water and soap. All produce should be thoroughly washed in cold, clean potable water. If storage is necessary, produce should be washed and promptly refrigerated.

Food Prep

Before preparing tasting, wash your hands thoroughly with soap and water. Wash your cutting boards, dishes, utensils, sinks and countertops with hot soapy water before and after each food item. It is a good practice to soak kitchen items in a weak bleach solution (1 tsp liquid bleach per quart of water) and rinse them thoroughly between uses. Make sure all of the students wash their hands before you serve a tasting.

Tasting Tips

Tasting a new fruit or vegetable is one of the most memorable aspects of the Garden Club experience for the kids, and often one of their favorite parts of the class. You may be surprised by how excited students are to try a new food. However, some students may be wary or uninterested in tasting new fruits or vegetables, and there are a couple of ways to ensure tasting is a fun and easy experience.

1. Prepare tasting before class begins by washing and cutting produce, and arranging it attractively on a plate.
2. Often in Garden Club we will prepare a salad or slaw that involves multiple fruits and vegetables, with lemon juice and/or a little bit of honey as a dressing.
3. If you have access to an oven, try roasting squash or root vegetables for a tasting that many students love.

4. Another popular tasting idea is to do a “taste test,” where students can compare several types of winter fruit, or several varieties of apple.
5. Before serving tasting, talk with students about having an open mind to new flavors, or 'food adventurous' and explain that they can take a small “no thank you” bite, and choose to leave the rest if they don't like it. Never force a student to taste something if they don't want to.
6. Ask students to use descriptive words like “interesting” or “different” instead of calling a new taste “gross” or saying “eww.”
7. If possible, harvest fruits or vegetables directly from the garden. Students are even more likely to try and enjoy fruits and vegetables they had a hand in growing themselves.

Evaluation

As we have gained experience developing and supporting school garden programs, it has been extremely helpful for us to gather information from students, parents, and volunteers in order to evaluate the impact of our program. We believe that this information not only informs our own program, but is also important in legitimizing school gardens as venues where students can learn skills associated with improved knowledge of healthy food choices and positive environmental practices.


During each class, we complete “Daily Feedback Sheets” in order to gather information about what our students are learning and recalling from previous classes, what students enjoy during particular lessons, as well as their experiences eating new fruits and vegetables. We find this information helpful for improving our lesson plans and the student experience, as well handy during our grant writing and reporting processes. We have included our “Daily Feedback Sheet” on page 21 as a sample of what may be helpful at your site. Depending on the structure of your program, this sheet may or may not be applicable, but we would recommend developing a system to help you evaluate the success/impact of your program.

In addition to a daily reporting system, we would also recommend developing a pre- and post-evaluation worksheet or survey for students to complete in order to gather information about any changes in their fruit or vegetable preferences and knowledge of healthy gardens and gardening concepts. We have begun to use FoodCorps' pre- and post-evaluation survey which includes opportunities for students to report their fruit and vegetable experiences and preferences. With permission, we have included the Veggie Preference Survey from FoodCorps as a pre/post test example following this section.


































It is important to make sure the evaluation questions align with the topics and information included in your lessons. We would recommend, as you develop lessons for your particular school site, to create questions that directly connect to



the lesson objectives. By creating this form of evaluation, you can get valuable information both about the effectiveness of your program and the impacts (both potential and realized) of school garden programs. It is important, when crafting your evaluation tool, to consider the ages of your students. For younger students, a paper survey may be inappropriate, in which case you would need to gather evaluation information and feedback using a different method, such as reading the surveys out loud, ask students to respond with hand raising and counting numbers of hands raised for each question.

















































Directions: Choose one circle for each food that best describes how it tastes to you.
Fill in the circle all the way, like this: 



Foods I am Rating	I like it	It's okay	I don't like it	I've never tried it
 Lettuce	 I like it	 It's okay	 I don't like it	 I've never tried it
 Carrots	 I like it	 It's okay	 I don't like it	 I've never tried it
 Zucchini	 I like it	 It's okay	 I don't like it	 I've never tried it
 Spinach	 I like it	 It's okay	 I don't like it	 I've never tried it
 Radish	 I like it	 It's okay	 I don't like it	 I've never tried it
 Cauliflower	 I like it	 It's okay	 I don't like it	 I've never tried it
 Peas / Snap Peas	 I like it	 It's okay	 I don't like it	 I've never tried it
 Bell pepper	 I like it	 It's okay	 I don't like it	 I've never tried it

Pre

Post

Foods I am Rating	I like it	It's okay	I don't like it	I've never tried it
 <p>Tomato</p>	 I like it	 It's okay	 I don't like it	 I've never tried it
 <p>Green beans</p>	 I like it	 It's okay	 I don't like it	 I've never tried it
 <p>Kale</p>	 I like it	 It's okay	 I don't like it	 I've never tried it
 <p>Beets</p>	 I like it	 It's okay	 I don't like it	 I've never tried it
 <p>Bok choy</p>	 I like it	 It's okay	 I don't like it	 I've never tried it
 <p>Sweet potato</p>	 I like it	 It's okay	 I don't like it	 I've never tried it
 <p>Broccoli</p>	 I like it	 It's okay	 I don't like it	 I've never tried it
 <p>Cucumber</p>	 I like it	 It's okay	 I don't like it	 I've never tried it
	 I like it	 It's okay	 I don't like it	 I've never tried it
	 I like it	 It's okay	 I don't like it	 I've never tried it

GARDEN CLUB DAILY FEEDBACK SHEET

Name of adult(s):

Parent/school volunteers? Name(s): _____

Of students: _____

Week # of program: _____ Date: _____

Tasting: _____

1. TAKE ATTENDANCE

2. CHECK IN ask students: **What do you remember from last class?**

Write answers below:

3. TASTING

How many have never tasted this before? _____

How many liked the tasting? _____

Who would eat this again or at home? _____ Who would like to grow it? _____

Note any other comments:

4. WRAP UP

Question 1) **What was your favorite part of class today?**

Question 2) **What new thing did you learn or do today in class?**

Lessons

Lesson I: Introduction to the Garden

Lesson II: Parts of the Plant

Lesson III: Seeds and Seed Dispersal

Lesson IV: Flowers and Pollinators

Lesson V: Bugs and Insects

Lesson VI: Soil and Compost

Lesson VII: Wondrous Worms

Lesson VIII: Celebration

Lesson I: Introduction to the Garden

Title: Introduction to the Garden

Time Needed: 60-120 Minutes

Age Group: Grades K-5th

Lesson Objectives: Students will be able to...

- Explain Garden Club activities, expectations, and routines.
- Demonstrate basic techniques for planting seeds in the garden.
- Explore the plant life cycle and discover what plants need to grow.
- Compare plant food needs to human food needs.

Vocabulary: Seeds, plant starts, transplants, potting soil, compost, trowel, rake, root, sprout, leaf, flower, fruit, seasons, seasonal plants.

Materials:

- Scavenger Hunt Handouts
- Grow Light (for Winter)
- Potting Soil for indoor planting or compost for outdoor planting
- Seeds appropriate for the season (i.e. lettuce, peas for spring, garlic or cover crops in the fall, and if starting plants indoors, broccoli, collards, etc).
- Popsicle sticks for plant labels
- Seed packets, tape, pens
- Garden journals and pens or pencils (or supplies to make journals)
- Garden tools
- Tasting Supplies

Discussion Questions:

What do plants need to grow?

(Do humans need the same things that plants need to grow? What are they?)

What types of food do you like to eat? What types of foods can we grow in our garden?

What is the first stage in the plant life cycle? (*seeds*)

What plant part makes the seeds?

Why do you think many plants stop growing in the winter?

Lesson Background

Planting with the Seasons:

The types of plants growing in school gardens vary by the season.

Fall: During the early fall, students may be able to explore plants leftover from the summer,



Lesson I: Introduction to the Garden

including tomatoes, basil, peppers, & summer squash. **Winter:** During the winter, students may explore the wildlife in the garden, watch garlic and cover crops sprout, and if a season-extender such as cloche is used, students may be able to grow colder weather plants such as lettuce, mustard greens, broccoli, and cabbage. These seeds will need to be planted in September or October. **Spring:** In the spring, students will be able watch lettuce, kale, chard, and peas sprout in the garden, as well as many types of vegetables, flowers and weeds.

Linking the garden to food, health and nutrition:

Different types of plants require different levels of light for growth and varying temperatures for germination and continued growth. If students have gardens at home, ask the students what they remember planting or growing during the different seasons. Discuss why certain plants may need different amounts of warmth, water, and nutrients to grow. Talk with students about what similarities there are between what people need to grow. Be sure to ask students what types of fruits and vegetables they like to eat and what types they'd like to grow in the school garden.

Exploring the Garden:

On the first day, it is important to set garden rules for safety and follow them throughout the term. As students begin to explore the garden, it is important to remind them to respect the plants and other creatures living in the garden. It is also important for students to understand that they should stay on paths and avoid stepping on garden beds, as this compacts the soil, making it difficult for plants roots to grow, as well as decreases the soil's capacity to hold water.

Planting Seeds:

The first day of class is a great opportunity to talk with students about the basics of planting in the garden. The information below provides an overview of how to plant different types of seeds, as well as how to effectively plant starts. Depending on the age of your students you can adapt the background information to include more or less detail.

Some important things to find out about each vegetable *before planting*:

1. **When** is it optimal to plant the seeds or start outside? (which month)
2. **How deep** do the seeds need to be planted?
3. **How far apart** do you plant the seeds or do you thin them after they germinate?
4. **Where to plant** this vegetable? (Does it need a trellis? Is full sun needed? etc?)
5. **How they might eat this vegetable** do students' families cook with it at home?
6. **When is it ripe** and how do you harvest it?

Direct Seeding: This means planting the seeds directly into the garden soil.

Big seeds: are best for younger children with less developed fine motor skills. Big seeds include: *cucumbers, squash, beans, peas, chard, beets & nasturtiums*:

- Make little holes where you want to plant your seeds. *The holes should be no deeper than your first knuckle.*
- Put 2 seeds in each hole. *About half of the seeds will actually sprout.*

Lesson I: Introduction to the Garden

- Cover with soil (no clumps) and lightly tap down.
- Gently water the soil after planting.
Watering too strongly will wash the seeds or soil away.
- Keep the top of the soil moist.
You will probably need to water once or twice a day.

Little seeds: Better for older children with more developed fine motor skills. Little seeds include: *carrot, spinach, lettuce:*

- Sprinkle the seeds over the soil.
- Cover the seeds with loose soil, 1/4 inch deep.
- Gently water the soil after planting.
- Keep the top soil moist.
- When the plants get their 2nd set of leaves, it's time for **thinning!**

Thinning:

Thinning is the process of removing extra seedlings to ensure each plant has adequate space to develop fully. How much to thin depends on the vegetable and the variety. All seed packets have instructions for how much space is needed between the plants. For fast growing crops such as lettuce or radishes, you can sow thickly, and pull out the small plants as they grow, until you have the recommended distance between plants. You can eat the tender seedlings of crops such as lettuce, beets, chard, spinach, making a delicious early treat for students in the garden. When removing larger plants, use a knife or scissors to cut the stem at ground level. This will thin the plant population effectively and will not damage the root systems of the remaining vegetables, which will occur if the unnecessary plants are pulled-out.

For more information about planting seeds, see Appendix III.

Planting Starts:

Plant starts are young plants that are used for transplanting.

How to Transplant:

- Water your plants well before transplanting.
- Dig a hole in the soil slightly larger than the container the plant is in.
- Carefully remove the entire plant (including the roots and soil) out of the pot.
- Gently place the clump, roots down, into the hole.
- Fill the remaining space in the hole with soil and gently pat down.
- After transplanting, water the soil around the plant, but avoid getting water on the leaves of the plant.

For more information about transplanting starts, see Appendix III.

Grow your own transplants: Using Grow Lights (for Winter Gardening Classes)

There are several options for using grow lights in the classroom. After you build or obtain a grow light find a place in the school that will be easy for you, or another individual at the



Lesson I: Introduction to the Garden

school, to care for throughout the winter months.

Hang the light 6 to 12 inches above the plants, and adjust the light based on plant growth (we use s-hook chains or twine to make it possible to adjust the light height). You could also raise and lower the plants using bricks, etc, if you have a fixed-height light fixture. When working at a school and using grow lights, it is important to make sure the plants are sufficiently watered, and that a timer is used to make sure the light is on for a sufficient amount of time during the day. Work with teachers incorporating taking care of the plants into regular student chores, or try to find a place for the grow lights in an office of an after-school program manager who can help maintain the plant starts if your hours working in the garden at the school are limited. *For more information about grow lights, see Appendix III.*

Making Garden Journals

There are many different ways you can make garden journals. One easy way is to use sheets of 8x11 paper and fold it in half. Use as many sheets as you'd like (5 sheets will make 10 pages, etc). Use a three-hole punch to punch holes in the folded paper and use string to tie the pages together.

Lesson I Procedure

Activity	Summary	Time Needed
Opening: Welcome to Garden Club!	<p>Introductions: Play a Name Game: “My name is __ and I love to...” or “My name is, and my favorite fruit or vegetable is...”, Reference? Take attendance.</p> <p>Go over general class rules.</p>	10-15 minutes
Pre-Evaluation/Check-in Questions	<p>Check in with students about what they know and what they would like to learn. Pass out pre-evaluation (see overview section) and explain to students how to complete it. For younger students, lead them through the evaluation by reading it out loud.</p>	20 minutes
Plant Personification or Thinning game	<p>Lead students in acting out the life of a plant to gain an understanding of what their seeds will go through in the next few weeks (see attached instructions, page xx).</p>	10 minutes
Garden Time: Planting	<p>Discuss with students what plants need to live (sun, water, soil), how plants make food through photosynthesis and get nutrients from the soil and fertilizer. What do people need to grow healthfully? (water, food, shelter, love etc). How are we different/same? Let students know they will be growing their own plants.</p> <p>Teach students how to plant seeds or transplants, either outdoors or under grow lights inside, depending on season, by demonstrating how deep to plant seeds, how many to plant, and how much space plants need to grow. Make sure students label what they plant with the variety, rather than with the students’ name.</p>	20 minutes
Plant Seasonality and Scavenger Hunt		20 minutes



Lesson I Procedure

Activity	Summary	Time Needed
<p>3rd-5th:</p> <p>K-5th:</p>	<p>Play the "Seed Packet Guessing Game". Select one student and tape a seed packet to his/her back. Have the rest of the students look at the type of vegetable the selected student represents. Have the selected student ask the other students yes or no questions about what vegetable s/he is representing, until they are able to guess which packet is taped to their backs. Use this as an opportunity to talk about what characteristics of seasons (temperature, light) can impact how plants grow.</p> <p>Prepare garden scavenger hunt/mapping activity, based on items available at your site. Have students work in partners to complete scavenger hunt activity (or assign volunteers/teachers to help younger students complete the activity). Encourage students to observe what is currently growing in the garden during the scavenger hunt. Ask students how they think the season relates to what is growing in the garden.</p>	
<p>K-2nd: Garden Story</p> <p>3rd-5th: Garden Journals</p>	<p>Read a gardening story that discusses plants/food growing during different seasons, i.e. <i>How Groundhog's Garden Grew</i>, <i>The Surprise Garden</i>, etc. (See Appendix I).</p> <p>Distribute or have students create a garden journal. Ask older students draw or write about their favorite thing they discovered on their garden scavenger hunt.</p>	15 minutes
Food and Nutrition	Wash hands. Give students a new fruit or vegetable to taste (ideally from the garden or something that is in season).	15 minutes

Lesson I Procedure

Activity	Summary	Time Needed
Closing	Clean up, Review lesson by asking “What did you find during the scavenger hunt? What are you most excited for in Garden Club? Why is it important to thin our plants? What season is it now?” Fill out feedback form*. Dismiss class. * Or evaluation method of your choice.	5-10 minutes

Lesson I: Game/Activity Instructions

Plant Personification

Activity Objective: Student will identify the different phases of the plant life cycle.

Description: Students act out the lifecycle of a plant

Time Required: 5-10 minutes

Preparation: Find a space indoors or outdoors where children can spread out

Procedure:

Ask students to spread out into a circle. Tell them that during this activity, they will be acting out the lifecycle of a plant. Ask one student in the group about his or her favorite fruit (remind students that tomatoes could be fruit). Tailor the activity to that particular fruit or vegetable.

- Begin by asking students to curl up into tight ball: You're a **seed!**
- Pretend to be a rain cloud and rain on the little seeds (students) underneath the soil. Tell students to uncurl and kneel. They've sprouted!
- Slowly uncurl feet, staying low to the ground. You've grown **roots**.
- Stick up arms like a little sprout-you've sprouted.
- Open your hands palms up, and wiggle your fingers-you've grown baby **leaves**.
- Wiggle your toes. You grow lots of little roots (rootlets).
- Grow a little taller and spread arms and hands out wider. You've grown bigger leaves. Tell students that their leaves are soaking up the sun, and making food for the plant.
- Stand up (feet together) – Your **stem** has grown taller.
- 'Slurp, slurp'- Your roots drink up water from the ground.
- Spread your fingers wide and surround your face- Your **flowers** are blooming.
- Pretend to be a bee or butterfly, and fly around the room pollinating the little flowers (or ask a student to help you).
- Interlock your fingers and make a circle over your head- you've produced a juicy ripe **fruit** – it is a tomato (or other fruit or vegetable).
- Tell the students that for some reason, in this garden, this one little fruit or vegetable was forgotten by the garden. You sway back and forth, and suddenly...
- 'Splat!'- The tomato (or other vegetable) falls off the stem and breaks on the ground.
- Little bugs and insects help the tomato break down, and suddenly, you are left with a tiny seed.
- Start the activity over, but have the students move through the actions more quickly.

Thinning game (adaptation/extension of Plant Personification):

Play plant personification game, but have students stand bunched together. As they “grow” they will bump into each other. Lead a discussion about how growing too close together makes it difficult for plants to get the sun and nutrients they need. Play again at arm’s distance apart, and discuss how the additional space affects the plants. Another option is to make “sun” and “nutrient” cards and sprinkle them around the students, and have them try and pick the card up during the game, simulating plants competing for resources. Only use this version if you think your group can handle it without being overly pushy or competitive.

Scavenger Hunt Activity (3rd-5th)

SCAVENGER HUNT

Find a PLANT in the garden?

Do you know what it is? _____

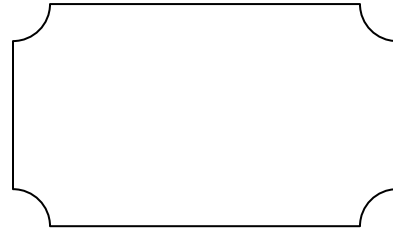
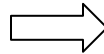
Is it a plant you would like to eat? YES NO MAYBE

List three COLORS you see in one of the garden beds/boxes:

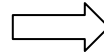
Find the COMPOST BIN. Name two things in the pile.

COUNT how many steps it takes to walk from the _____ to the _____

Draw a little map of your path.



Find an INSECT or BUG. Draw it.

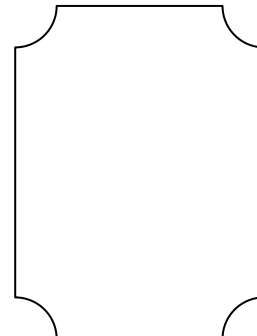
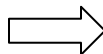


How many legs does it have? _____

What do you think it eats? _____

How does it travel? _____

Find a FLOWER. Draw it.



3. Planting Calendars (For Seasonal Planting Discussion):

SPRING, SUMMER AND FALL PLANTING CHART

Vegetables & Herbs	Direct seed or transplant?	Planting Date (outside)	Space between plants	Seed Depth	Time from Seed to Harvest
Basil	Either	April/after frost	1-2"	1/8"	6 weeks
Beans (snap)	Direct Seed	May - June	4"	1"	8 weeks
Beets	Direct Seed	May – June & July – Aug	4-6"	.5-1"	8 -12 weeks
Broccoli	Either	March - August	18-24"	.5"	14 weeks
Brussels sprouts	Either	May - July	24"	1/4 - 1/2"	12-16 weeks
Cabbage	Either	April - June	18"	1/4"	16 weeks
Carrots	Direct Seed	March- July 15	3"	1/4"	10 weeks
Cauliflower	Either	April - July 15	22"	1/4"	14-19 weeks
Celery	Transplant	March - July	6-8"	1/8"	15-20 weeks
Chard	Either	April - July	10-12"	3/4"	NA
Cilantro	Direct Seed	April - May	1"	1/2"	NA
Collard Greens	Either	June	6"	1/4 - 1/2"	NA
Corn (sweet)	Direct Seed	April - July	12"	1-2"	9-13 weeks
Cucumber (slicing)	Either	May- June	18"	1/4 - 1"	6-8 weeks
Cucumber (pickling)	Either	May- June	18"	1/4 - 1"	6-8 weeks
Dill	Direct Seed	May	9"	1/4 - 1/2"	8 weeks
Eggplant	Transplant	June	18-24"	1/2 - 1"	8-11 weeks
Garlic	Direct Seed	Sept - October	4"	1-2"	9-10 months
Kale	Direct Seed	May - July	8-16"	1/2"	NA
Leeks	Direct Seed	March - July	6"	1/4"	10-12 weeks
Lettuce (head)	Either	April - July	10-12"	1/4 - 1"	6-8 weeks
Lettuce (leaf)	Either	April - August	6"	1/4 - 1"	6-8 weeks
Onions	Either	March- May	3-4"	1/2"	12-13 weeks
Oregano	Direct Seed	April - May	10-12"	1/4 – 1/2"	NA



Vegetables & Herbs	Direct seed or transplant?	Planting Date (outside)	Space between plants	Seed Depth	Time from Seed to Harvest
Parsley	Either	March - June	6"	1/4 - 1/2"	NA
Peas	Direct Seed	February - May	1-2"	1-1.5"	8-10 weeks
Peppers	Transplant	May	18"	1/4"	14-15 weeks
Radish	Direct Seed	March - September	12-15"	1-4"	3-5 weeks
Spinach	Direct Seed	April & September	1-3"	1/2"	5-7 weeks
Squash (summer)	Either	May - June	6"	1"	7-8 weeks
Squash (winter)	Either	May	6"	1"	12-15 weeks
Tomatoes	Transplant	April/after frost	24-36"	1-4"	8-15 weeks

WINTER PLANTING CHART – COLD HARDY VEGETABLES

PLANT TYPE	WHEN TO SOW (DIRECT-SEED)	WHEN TO HARVEST
Winter Leeks	Mid April–May	October—early April
Fall and Winter Cabbage	Late May—Late July	Late Fall and Winter
Swiss Chard	Mid June—Mid July	Fall and early Winter
Fall Broccoli	Mid June—Late July	Fall and early Winter
Fall Cauliflower	Early July	All Fall
Parsnips	Early July	September—January
Carrots	Early July and September	All Winter and Spring
Rutabaga	Mid-Late July	All Winter and Spring
Beets	Mid-Late July	All Winter
Over-wintering Broccoli	Mid-Late July	Late Winter and Early Spring
Mustard Greens	Mid July-mid Aug (without cloche) <i>Sept-Oct & Feb-March (with cloche)</i>	September—April <i>Nov-June (with cloche)</i>
Spinach	Mid July-Mid August	September—April
Turnips	Mid July—Late August	September—April
Arugula	Mid July- Late September	Winter and Spring
Kale	Mid July—September	All Winter and Spring

Collard Greens	Mid July—September	All Winter and Spring
Endive	Late July-Early Sept (without cloche) <i>Sept-Oct (with cloche)</i>	Sept-Nov (without cloche) <i>Nov-June (with cloche)</i>
Spinach	<i>Late July-Oct, & Feb-March (with cloche)</i>	<i>November—June (with cloche)</i>
Over-wintering Cauliflower	Early August	Spring
Lettuce	Early August (without Cloche) <i>Sept-Oct & Feb-March (with Cloche)</i>	Fall (without cloche) <i>Nov-May (with cloche)</i>
Over-wintering Bulb Onions	Early August	May and June
Spring Cabbage	August—Mid September	All Winter and Spring
Garlic	Early September	July
Shallots	Early September	July
Corn Salad	September	October—April
Fava Beans	Oct 1—November 15	Early June—Early July
Peas	October—Early November	Early Spring

Oregon State Extension Service Gardening Encyclopedia. Monthly Planting Calendars.
<http://extension.oregonstate.edu/gardening/calendar/>



Lesson II: Parts of the Plant

Title: Parts of the Plant

Time Needed: 60-120 Minutes

Age Group: Grades K-5th

Lesson Objectives: Students will be able to...

- List the six parts of a plant.
- Describe the life cycle of a plant.
- Explore the parts of the plants that people eat.

Vocabulary: Roots, stems, leaves, flowers, fruits, seeds, life cycle, photosynthesis, nutrients, plant food/energy

Materials:

- Poster of plant parts
- Mystery Canisters (see attached instructions)
- Garden journals (From Lesson I)
- Franken-Plant Materials: paper, glue, pens/pencils, example
- Leaf rubbing materials: crayons & paper
- Tasting: Plant Parts Veggie Wrap (see recipe)

Discussion Questions:

What is the first stage in this plant's life cycle?
What plant part makes the seeds?
What makes the leaves of this plant special from another plant?
How do the leaves help this plant?
Can we eat plants? If so, which parts?
Why is eating plants good for our bodies and health?
How many plants should we eat? What types?

Lesson Background

Plant Parts/Botany

There are six general parts of a plant: roots, stems, leaves, flowers, fruits and seeds. These six parts happen in succession during the **life cycle** of a plant. At each stage of the life cycle, there are parts of the plant that are most commonly eaten by people (see list attached to lesson with examples of each part of the plant that we eat).

Each stage is essential in the growth of the plant, and when cultivated they are often grown for specific parts and consumption.

The **roots** take up water and nutrients from the soil and act as an anchor for the plant.

Stems are the support system for the parts of the plant above ground; they provide structure

Lesson II: Parts of the Plant

and act as a pathway for nutrients to travel up and down the plant as well as a place for nutrient storage. **Leaves** make food for the plant using **photosynthesis** to convert light from the sun, water from the soil and carbon dioxide from the air into carbohydrates or sugars (food). **Flowers** are the reproductive part of a plant. They usually produce **fruit**, which contain seeds. **Seeds** grow into new plants with water, nutrients from the soil, and sun which warms the soil. A **Vegetable** is considered any parts of the plant we eat that are not considered fruits, flowers or seeds. A fruit is typically considered to be sweet, but peppers, tomatoes & squash are all 'fruit' because they contain the plants seeds.

Nutritional Value of Plants:

It is recommended that people eat 5-9 cups of fruits and vegetables per day for a healthy diet. Fruits and Vegetables include many important nutrients and phyto-chemicals that keep our bodies healthy. Most fruits and vegetables are low in calories. Seeds typically contain a large amount of protein & fat that is necessary for brain and cell health. Encourage students to think about how they can increase the amount of fruits and vegetables they eat everyday. The USDA recommends making $\frac{1}{2}$ you plate at each meal to contain fruits and vegetables.



Lesson II Procedure

Activity	Summary	Time Needed
Opening	Attendance, check-in about previous week, rules reminder, agenda for the class.	5-10 minutes
Introduction to Plant Parts K-2 nd : 3 rd -5 th :	<p>Ask students to give examples of plant parts that we eat. Show plant part poster and teach students to sing plant parts song.</p> <p>Show plant part poster and ask students to list parts of the plants that we eat. In pairs, have students work together to identify different parts of a plant in the garden. In their journal they can draw a plant and label the parts.</p>	10 minutes
Plant Part Identification Activities K-5 th :	<p>Plant Personification: (See Lesson 1: Intro to the Garden). Students will act out the life cycle of a plant, identifying each plant part.</p> <p>Mystery Canisters: Using the sense of touch and smell, students identify different plant parts in mystery canisters (see attached instructions).</p>	10-15 minutes
Garden Time: K-2 nd : Leaf Rubbings & Plant Part Identification 3 rd -5 th : Planting	<p>Leaf Rubbings: Ask students to collect different leaves from the garden? What are the differences? What are the similarities? Why are leaves important to plants? Are the leaves edible to humans? Have students select their favorite leaf and do a leaf rubbing to take home.</p> <p>Plant Part Identification: (see attached instructions).</p> <p>Check on seeds or transplants planted the week before, and plant seeds relevant to season.</p>	20-30 minutes
Art Activity: Franken-plants	Students collect garden materials or use paper to create their own plant creatures incorporating the six different plant parts.	15 minutes + 5 minutes to clean up

Lesson II Procedure

Activity	Summary	Time Needed
Food and Nutrition	Discuss why eating fruits & vegetables are important to a healthy diet. Using a collard or chard leaf, make a veggie wrap containing any combination of plant parts (see attached recipe).	15 minutes
Closing	Clean up, review lesson by asking “What are the six parts of a plant?” What is a stem that we eat...?” What did we plant last week?” Fill out feedback form*. Dismiss class. * Or evaluation method of your choice.	5-10 minutes



Lesson II: Game/Activity Instructions

Plant Parts Song (K-2nd grade)

Singing “Roots, Stems, Leaves, Flowers, Fruits and Seeds,” make hand and body movements. ***No specific tune for this song, enjoy making one of your own. ***

1. Hands on the ground for roots;
2. Hands flat against legs for stems;
3. Hands opening up towards the sky for leaves;
4. Spread your hands wide around face for flowers;
5. Circle your arms like you are holding a ball for fruits;
6. Plop down to the ground to resemble a big, bursting fruit falling to the ground to release its seeds.

Plant Personification (K-2nd grade)

See lesson plan activities for Lesson 1: Introduction to the Garden.

Mystery Canisters Activity (K-2nd grade)

Discover the parts of a plant hidden within *Mystery Containers*.

Goal: To introduce students to the parts of a plant that we eat.

Objective: To use the information learned about plant parts to identify them by touch.

Time: 15 minutes

Preparation: Show students a plant parts diagram; have them brainstorm different parts of plants we eat.

Materials: Several cardboard boxes (or paper bags), various plant parts from different plants.

Procedure: Ask the students to name the six parts of a plant. Review each one and ask them to say what each part does for the plant. Go out and collect several plant parts. Make six or more “blind, touch and feel” boxes by cutting a hand holes in one side of a box (if time allows, cut the foot off a sock and staple sock around hole, this way students put their hands into the sock and cannot see into the box). Place a different plant part in each box and number the boxes. Have the students number a sheet of paper, go to each plant box and guess each part by feeling only, and write their guesses on their papers by the corresponding box numbers (remind students to stay quiet to not give it away!). After the whole group has completed guessing, unveil each part and review its purpose for the plant.

(Adapted from: Junior Master Gardener Teacher/Leader Guide Level 1, pg 9)

Plant Part Identification

Goal: To introduce students to the parts of a plant that we eat.

Objective: To use the information learned about plant parts to identify them by touch.

Time: 25 minutes

Preparation: Write out prompts for student reference. Gather seed packets or pictures of flowering/fruited plants that are in the garden. Review plant parts diagram and brainstorm different parts of plants we eat as a whole group.

Materials: Garden club journals, pencils/crayons, seed packets or pictures of flowering/fruited plants from the garden.

Procedure: In pairs, students will work together to identify different parts of a plant in the garden. They should record their findings in their journal by drawing the different parts and labeling them. For plant parts that are unknown, the students should brainstorm what that would look like, then reference seed packets or other materials.

If you have extra time, have students discuss with their partner the following prompts.

What is the first stage in this plant's life cycle?

What plant part makes the seeds?

What makes the leaves of this plant special from another plant?

How do the leaves help this plant?

Can we eat this plant? If so, what part of this plant do we eat?

Leaf Rubbings

Collect leaves from the garden. Place leaves between two sheets of paper. With a crayon, rub the top page of the paper so that the shape of the leaf comes through on the page.

Franken-plants

Goal: To review the parts of a plant in a creative way.

Objective: To use the information learned about plant parts to create a plant of their own.

Time: 15-20 minutes

Preparation: Prepare art materials that will be used. Create a sample.

Materials: construction paper per student, glue, tape, markers/crayons, plant parts from the garden or miscellaneous art materials, such as various types of paper, pipe cleaners, stickers, glitter, magazine bits & string.

Procedure: Students collect garden materials or use paper to create their own plant creatures. Challenge them to incorporate all six different plant parts. If there's time, have them create an environment for their plant, and purposes for their plant parts.

Edible Plant Parts

Use this chart to help students identify different plants they eat, and which part of the plant they are.

FOODS WE EAT THAT ARE ROOTS	FOODS WE EAT THAT ARE STEMS	FOODS WE EAT THAT ARE LEAVES
Beet	Asparagus	Brussels sprouts
Carrot	Bamboo shoots	Cabbage
Onion	Bok Choy	Chard
Parsnip	Broccoli	Collards
Potato	Celery	Endive
Radish	Kohlrabi	Kale
Rutabaga	Rhubarb	Lettuce
Sweet potato		Mustard greens
Turnip		Parsley
Yam		Spinach
		Turnip greens
		Watercress
FOODS WE EAT THAT ARE FRUIT (anything that contains seeds)	FOODS WE EAT THAT ARE FLOWERS	FOODS WE EAT THAT ARE SEEDS
Apple	Artichoke	Almonds
Apricot	Borage	Black beans
Avocado	Broccoli	Butter beans
Banana	Calendula	Cocoa
Berries	Cauliflower	Dry split peas
Cucumber	Nasturtiums	Wheat (flour, pasta)
Date	Pansies	Kidney beans
Eggplant		Lima beans
Grapefruit		Peas
Grapes		Oats (oatmeal)
Pear		Pinto beans
Pepper		Popcorn
Pineapple		Pumpkin seeds
Pumpkin		Rice
Squash		
Tomato		

Recipe: Plant Parts Veggie Wrap

Ingredients:

- Root (carrot, beet, radish, etc.)
- Stem (celery, green onion, leeks, etc.)
- Leaf (lettuce, kale, collards, sorrel –large enough to wrap veggies in)
- Flower (broccoli, cauliflower, edible flower)
- Fruit (tomato, peppers, apples, etc.)
- Seed (sunflower seeds, beans, or bean dip (such as hummus) etc.)

Supplies:

Cutting board, knife, large plate, small serving bowl, plates for all students.

Directions:

1. Make sure to use safe food handling procedures. **Rinse** all vegetables really well.
2. Get a plate large enough to hold all of the veggie slices. After you are done cutting one vegetable, place them together on the plate while leaving space for the others so it looks similar to several slices of pie.
3. Slice **root** veggies in thin strips.
4. Cut **stem** in long thin strips – if using an onion, cut thin enough so flavor won't be too strong.
5. Cut off any long stem from **leaf** – this will depend on the leaf – some may not have a long stem, like lettuce.
6. Chop **flower** in small pieces – they are very fibrous and can be hard to chew if too large.
7. Cut **fruit** into long strips, circles, or small pieces depending on the fruit.
8. Pour **seeds** into a separate bowl. If using a bean spread, place in a separate bowl.
9. Make a demo plant part wrap - take the large leaf, lay it flat on a plate with the curled sides facing up. Add a few items from each category on top of the leaf - make sure it isn't too full so that you can wrap the leaf around it. Roll it up and you have a plant part wrap!
10. After all students have washed their hands, invite each student to make their own wrap.
11. Sit down and eat the wraps together. Discuss how they taste and how students could make this at home.

Lesson III: Seeds and Seed Dispersal

Title: Seeds and Seed Dispersal

Time Needed: 60-120 minutes

Age Group: Grades K-5th

Lesson Objectives

Students will be able to:

- Explain that seeds are produced in a variety of sizes, shapes, and colors.
- Describe the germination process and the parts of a seed.
- Describe the basics of seed production (as part of the plant life cycle) and seed dispersal.

Vocabulary: Seeds, seed coat, stored food/nutrients, germination, seed dispersal

Materials

- Plant life cycle poster & seed poster
- Presoaked (overnight) bean seeds (1 per student)
- A variety of seeds
- Examples of fruits that contain seeds: i.e. tomato, squash, peppers, and flowers.
- Seed Matching Game (see attached instructions)
- Materials for paper-making or seed papers.

Discussion Questions:

What do seeds need to grow?

Why do seeds have different characteristics (shapes, sizes, etc)?

Why are seeds important for people and wildlife?

Lesson Background

Seeds: Seeds are the basis of life. Seeds are contained within the fruits of the plant. Seeds contain a new plant, as well as **stored food** or **nutrients** that new the plant needs to grow. Seeds need specific temperatures and water to **germinate** or break open the **seed coat** (the hard outside coating of seeds) and sprout. Once a seed sprouts, it extends roots into the soil, emerges through the soil, and produces a small plant called a seedling. Remind students of plant parts lesson and plant life cycle. Where did the seed come from? How does the plant grow from seeds?

Seed dispersal and wildlife: Seeds come in many different shapes and sizes, and these different shapes, sizes, and other characteristics help the seed travel to new places to grow. For example, an acorn from a tree falls to the ground around that tree, but a squirrel could pick it up and carry it to a new location. A dandelion seed is very light, and has a little

Lesson III: Seeds and Seed Dispersal

“parachute” that helps it move long distances in the wind. What are other ways seeds can travel?

Nutritional value of seeds: Can you think of a seed you eat? (Examples include: Garbanzo beans in hummus, almonds, pumpkin seeds, sunflower seeds, bread is made from seeds (grains are seeds of grasses). Seeds have a lot of energy – the energy is needed for the seed to grow and when we eat those seeds, we get a lot of energy and protein from them.

Lesson III Procedure

Activity	Summary	Time Needed
Opening	Attendance, check-in about previous week, quick rules reminder, agenda for the afternoon.	10 Minutes
Seed Dissection Activity	Show seed poster and discuss germination with students before beginning seed dissection. Provide students with seeds (beans work best) that have soaked overnight to dissect and discuss why seeds are important. Bring some un-soaked seeds to show the difference between the soaked and un-soaked seeds.	15 Minutes
Seed Exploration and Seed Saving	If available, go to the garden and have students look for different types of seeds. Bring an example of a familiar plant that has gone to seed. Introduce students to seeds by cutting open a pepper or squash. How many seeds are inside? How many plants could be grown from those seeds? What are students' favorite seeds to eat?	15 Minutes
Seed Matching Game	Play Seed Matching game (see attached instructions).	15 Minutes
Paper-making or Seed papers (time depending)	<p>Students will either create homemade paper using flowers and seeds or create seed strips that can be planted.</p> <ol style="list-style-type: none"> 1. For paper, have students collect materials from the garden, and provide students with small seeds that can be easily incorporated on to paper (carrots, lettuce, etc). (See attached instructions). 2. Use white glue and glue seeds to paper (teaching students about the appropriate spacing for different types of seeds). 	<p>1 hour for paper making, plus drying time.</p> <p>20 Minutes for Seed Papers</p>
<p>Garden Time: Planting Seeds</p> <p>K-5th:</p> <p>3rd-5th</p>	<p>Check on plants planted in previous weeks. Plant more seeds or starts relevant to the season.</p> <p>Before planting have students find/read information on the seed packet. How many days after planting will they sprout? How deep should the seeds be planted? What temperature</p>	15-20 Minutes

Lesson III Procedure

Activity	Summary	Time Needed
	<p>does the plant need to grow? How much space should there be between the seeds? What will it look and/or taste like after it is harvested? Have students' journal their findings and use the "Watch Your Seeds Grow" worksheet throughout the following weeks.</p>	
<p>Seed Dispersal Activity</p>	<p>Talk to students about how seeds are transported around in the world (i.e., have they ever had seeds stick to their pant legs or pet? Have they ever noticed how dandelion seeds are carried in the wind?). Bring some examples if possible or explore in the garden. Then ask students to draw their own imaginary seed with a way for it to be carried to another place in the world, encourage them to be inventive. Ask the students to share their seed designs with other students.</p>	<p>15-20 Minutes</p>
<p>Food and Nutrition</p>	<p>"What kinds of seeds are foods that we eat (Pumpkin seeds, corn seeds, bean seeds, pea seeds, sesame seeds, sunflower seeds, grain, nuts, coconut)? Why are seeds healthy for people to eat? Prepare and serve tasting (hopefully including some seeds, think seasonally).</p>	<p>10-15 Minutes</p>
<p>Closing</p>	<p>Clean up, review lesson & ask discussion question: What do seeds need to germinate and grow?" Fill out feedback form*. Dismiss class. * Or evaluation method of your choice.</p>	<p>5-10 Minutes</p>

Lesson III: Game/Activity Instructions

Seed Dissection Activity

Grades: K-5th

Objectives: Learn about the seed germination process and, using scientific names, identify the parts of a seed.

Materials:

- Soaked bean seeds
- Diagram of a seed and poster of seed growth cycle (including labeled seed parts, such as seed coat, cotyledon, embryo, endosperm).
- Plates or paper towels for each student

Preparation: Soak bean seeds overnight, make sure there is one seed per student.

Activity Instructions:

Ask students what they know about seeds: What is in a seed? What causes a seed to grow? Show them a variety of seeds. What seeds do they eat? Why do seeds grow in a variety of different shapes?

Hand out softened beans and have students dissect looking for all the parts.

Questions:

What would happen in a place where it doesn't rain? What if the seed did not have any food included in the seed coat? Why are seeds important?

Seed Papers and Paper-Making

Grades: K-5th

Objectives: To understand the process of decomposition (of paper, or other carbon materials) and seed spacing.

Materials:

For seed papers:

Strips of construction paper or white paper
Different types of seeds (large and small)
Washable, non-toxic markers for labeling
White, non-toxic glue

For paper-making:

Paper-making screens (made from old, small picture frames with wire screen stapled to each side of the frame)

Towels

Recycled paper that has soaked overnight

Blenders

Water

Washcloth or Sponges

Plastic tubs for draining water from screens and holding blended paper pulp

Small seeds, flower petals, and leaves from the garden

Preparation:

For seed papers: Create sample seed paper strips to show students different spacing required by different types of plants. You may also want to do a quick activity with students on square foot gardening so they can better visualize the amount of space required by different types of fruits and vegetables.

For paper-making: You may want to soak sheets of recycled office paper, construction paper, etc, overnight to speed up the process. You may also want to blend some of the soaked paper with additional water, in advance, to ease the process/reduce the amount of time it takes to produce the paper.

Before class, blend the soaked paper with water to create the paper pulp. Do this enough times to fill the plastic tub where students will dip the frames with the screens. Add water to the pulp to make it easy to dip the frame into the tub.

Lay out towels or newspapers where students will be able to let their paper dry. Provide students with scrap paper and pens to label their paper creations.

Activity Instructions:**For Seed Papers**

1. Explain the activity to students. Ask students what they think would happen to paper if they buried it under soil. What do seeds need to grow? How much spacing do plants need to grow?
2. Distribute strips of paper and glue to students at tables. Show students the sample seed papers, with spacing for different types of vegetables. Ask students to look at the back of seed packets to see how seed packets show the needed spacing for different plants.
3. Provide students the different types of seeds in cups or on plates, and ask them to glue the seeds to the paper using the correct spacing.
4. Find a place in the classroom for the seed papers to dry. Students may put their names on the papers.
5. The following week, have students plant their seed papers in the garden. You may also want to send the papers home for them to plant with their families.

For Paper Making:

1. Ask students to collect materials from the garden that they would like to include in their paper. Remind them that the materials need to be able to lie flat, and that there will only be space for a few items (enough to cover your palm).
2. Bring students inside and demonstrate how to make the paper. Show the students the soaked recycled paper, place it in the blender with enough water to cover the paper, and blend. Pour the pulp into a plastic container large enough to dip the frame into and add water.
3. Dip the frame into the pulp and water mixture and lift up. The pulp should cover the screen. Gently press the water out of the pulp, through the screen, using your hand, a sponge, or a wash cloth. Continue pressing until as much water as possible has been removed from the frame.
4. Turn the frame over on to the towel and tap the back of the frame to release the paper. Have students add the plant materials by pressing the materials into the slightly wet paper pulp.
5. Let the paper dry (label with a piece of paper including the students' name). Depending on the thickness of the paper, the paper may take up to a week to completely dry.
6. Students may want to give the paper as a gift to a family member, or, if the student included seeds, students can also plant their paper in the garden!

Seed Matching Game

Grades: K-5th

Objectives: Students will learn to identify different types of seeds.

Materials: 8 seed packets, ideally very distinct seeds i.e. corn, pumpkin, broccoli, sunflower, peas, carrots, tomatoes, pepper.

Activity Instructions: Empty seed packets, and put each seed type in a separate plastic baggie, or a small, clear, plastic box. Cut the seed packets in half and past the front half of each packet to a large piece of paper. Copy this page and laminate if possible. Make as many copies as you need, and make sure you have enough seeds for each set. Have the students divide into pairs, and pass one page to each pair of students, along with containers or baggies of each seed. Ask the pairs of students to match the seeds to their packet.

Watch your Seeds Grow

Use this chart to draw one of your seedlings as it grows. Each week, draw a picture of your plant and write down how tall it is.

Week 1 height _____ <i>Name of seed:</i>	Week 2 height _____ 	Week 3 height _____
Week 4 height _____ 	Week 5 height _____ 	Week 6 height _____

Take Note!

How many days after planting did the first seedling poke through the soil?

How many days did it take for all the seedlings to appear?

Other observations:

Lesson IV: Flowers and Pollinators

Title: Flowers and Pollinators

Time Needed: 60-120 minutes

Age/Grade: K-5th

Lesson Objective:

Students will be able to:

- Describe the basic anatomy of a flower.
- Define and be able to give examples of pollinators.
- Describe how a plant is pollinated.
- Describe what occurs after pollination.

Vocabulary: Pollen, pollinator, pollination, stigma, style, filament, petal, stamen, anther, pistil, sepal, ovule, nectar.

Materials:

- Enough flowers for each student to dissect one (look around gardens or you may have to purchase cheap flowers during the winter)
- Flower anatomy diagrams
- Pictures of different pollinators (see resources list for ideas)
- Pollination Game Materials (see attached instructions)
- Tasting: An edible flower (i.e. broccoli, cauliflower, squash blossoms, nasturtium)

Discussion Questions:

Who can name a type of a flower?

How do flowers get their names (dandelion)?

Why are flowers such bright colors?

What is a pollinator? What are some examples of pollinators?

Do people eat flowers? Are all flowers edible? (no! but some are)

Lesson Background

Flowers are the reproductive parts of a plant. Flowers are designed to make fruits and create seeds that grow into new plants. Color, shape and scent of the flower attract various insects and birds that travel from flower to flower picking up and leaving pollen behind. The pollen travels deep into the flower and meets the ovary. Once pollination has occurred, the petals fall away and seeds develop in the ovary, with the ovary itself becoming fruit.

Flowers are composed of several parts. A **pistil** is the group of female reproductive parts of the flower which includes the stigma, style and ovary. The **stigma** receives the pollen from

Lesson IV: Flowers and Pollinators

insects and other pollinators. The **style** is the stem that holds up the stigma. The **ovary** produces the seeds used to grow new plants. Fruit is the fertilized ovary of a plant. **Stamens** are the group of male reproductive parts of the flower that include the anther and filament. An **anther** creates the pollen. A **filament** is the stem/stalk that holds up the anther. **Sepals** are the leaf-like parts under the petals that protect the flower bud while the flower is developing. They are usually green and able to produce food from the sun (photosynthesize). **Petals** are the largest part of the flower: beautiful, colorful and sweet-smelling to attract pollinators.

Pollination occurs when male pollen lands on the female stigma, travels down the style, and fertilizes the female ovary. The fertilized egg develops into seeds and nuts that fall into the soil and then grow into new plants. Flowers can't move so they have evolved to find ways to make sure pollination takes place such as: bright colors, aromatic nectar, shape of flower designed for certain type of pollinators and/or lightweight flowers for wind pollination.

A pollinator is anything that helps spread flower pollen. There are all kinds of pollinators: birds, bats, bees, bugs and even wind. Pollen is produced by the male reproductive part of the flower, and is composed of fine powder-like grains that contain male sex cells. Pollinators are out collecting pollen to bring back to the nest and to drink nectar. They go from flower to flower to get food (nectar). They get pollen on their legs or beaks and then when they go to another flower to eat, they drop off pollen from other flowers.

Plants reflect the type of pollinator it's trying to attract through the size, the color, the scent, amount of nectar, composition of nectar, etc. For example, birds visit red flowers with long narrow tubes and lots of nectar, but are not as strongly attracted to wide flowers with little nectar and copious pollen, which are more attractive to beetles.

For example:

Beetles are attracted to white or dull-colored flowers with a fruity or spicy fragrance.

Honey bees are attracted to showy, bright petals, often blue or yellow.

Mosquitoes: Small flower, often white or green.

Butterflies: Red, orange, blue, or yellow flowers.

Bats: Large flower with fruity fragrance and lots of nectar.

Hummingbirds: Red flower, little or no fragrance.

Moths: White or yellow flowers with heavy fragrance.

Wind helps pollinate small, odorless, colorless flowers (i.e.: grasses, corn).

Lesson IV Procedure

Activity	Summary	Time Needed
Opening	Attendance, check-in about previous week, rules reminder, agenda for the class.	5-10 minutes
Flower Anatomy and Pollination	Using flower anatomy poster, describe role of each flower part. Discuss how plants are pollinated. One good place to start is with: "Every fruit that you enjoy was once a flower—once that flower is pollinated, it becomes fruit."	10 minutes
Garden Time: Flower Hunt	Go on a flower hunt (in the garden weather permitting or using picture books), and collect and create new names for flowers based on flower characteristics. Ask students to consider what type of pollinator would be attracted to each flower. Have students share one flower name and information about the flower with the rest of the class. Check on plants planted in previous weeks and observe their growth.	15 minutes
Flower Dissection	Students work in pairs dissecting flowers. Ask students to examine their flowers and look for the different flower parts, and lead them through the dissection (see attached instructions).	15-20 minutes
Pollination Game	See attached instructions.	15-20 minutes
Food and Nutrition	Harvest snack from garden or have students do a "Flower Taste Test" with edible flowers (like nasturtium, calendula, or borage) and broccoli and cauliflower.	10-15 minutes
Closing	Clean up, review lesson by splitting students into pairs. In pairs, have students share what happens after a flower is pollinated (it will become a seed/fruit). Fill out feedback form*. Dismiss class. * Or evaluation method of your choice.	5-10 min

Lesson IV: Game/Activity Instructions

Pollination Game

Grades: K-5th

Objectives: To explore how the pollination process leads to seed and fruit production and how different types of plants have different types of pollen.

Materials:

- Flower headbands (two of each type of flower used). Make flower headbands using different photos of flowers and gluing them on strips of paper long enough to wrap around children's heads. You can add Velcro after the paper is laminated.
- Bee or other pollinator headbands (see information above).
- Envelopes with different pollen types (different color squares of paper) for each flower.

Game Instructions:

1. Divide the students into two teams.
2. For each team, assign one student to be a flower and one student to be a bee (or other pollinator). It is helpful to have headbands or armbands to signify which students are bees and flowers.
3. Tell the remaining students that they are the flower's "pollen". Provide students pieces of paper to signify the pollen, and tell them to hide their pollen in a pocket.
4. Ask teams to stand on different sides of a field.
5. Tell students that when you say go, the bee from each team needs to run and tag the "pollen" students. When a "pollen" gets tagged, they reveal which flower they belong to, by showing the "pollen" in their pocket. If they are from the opposite team, the bee brings them back to their home flower.
6. When that pollen touches their home flower, the pollen "pollinates" that flower and becomes a seed.
7. Ask students that are pollinated to curl up like a little seed to help the bee pick out students that have not helped pollinate the flowers.
8. When the bee has gathered all the pollen from one team, the game is over.
9. At the end of the game, ask students how the game relates to pollination. How does pollination help us grow fruits and vegetables?

Flower Dissection

Grades: K-5th

Objectives: To explore how the pollination process leads to seed and fruit production and how different types of plants have different types of pollen.

Materials: Flowers, plates or paper towels

Process:

Lead students through the dissection step by step:

1. First count the petals as you pull them off-how many petals do you have?
2. Next count the stamen and anthers, how many do you have?
Does anyone have anything yellow on their hands? What do you think that is?
3. Now we have the pistil, let's pull it open, does it feel sticky inside?
Why do you think it is sticky inside?
Where can I find pollen in this flower?
4. How many anthers are there?
5. What is the sticky part called (stigma)?
Why is it sticky? (to collect pollen)
6. What will eventually happen to the flower? (it will become a seed/fruit)
Do all flowers look the same?
Do different types of flowers have the same parts?

Lesson V: Bugs and Insects

Title: Bugs and Insects

Time Needed: 60-120 minutes

Age/Grade: K-5th

Lesson Objectives:

Students will be able to:

- Describe the basic anatomy of an insect.
- Identify some beneficial and pest insects in the garden.

Vocabulary: Exoskeleton, anatomy, antennae, compound eyes, thorax, abdomen, wings, predators, pollinators.

Materials:

- Anatomy of an Insect Poster
- 15 bug collecting jars (preferably plastic)
- Ladybug/Aphid Tag costumes (see attached instructions)
- Tasting supplies for edible insects
- Toothpicks.

Discussion Questions:

What is an insect?

Why are insects important for the garden?

Where do different insects like to live in the garden? Why?

What do different insects eat?

Lesson Background

Insects are part of an animal group known as '*arthropods*'. Arthropods have a hard protective exterior case known as an 'exoskeleton'. Arthropods contain a host of well-known multi-legged creatures including arachnids (spiders), millipedes and crustaceans (ocean lobsters and crabs).

For the purpose of the lesson, we will teach about arthropods that have six main features: two antennae, compound eyes, six legs, and two pairs of wings, a thorax and an abdomen. Not all insects have wings; it depends on the species (for example ants are insects but some have wings and others do not).

Biology The exoskeleton makes up the entire surface of the insect's body put together by separate plates meeting the joints of the body and legs. Arthropods do have muscles within the exoskeleton, but the muscles attach to the exoskeleton itself (as opposed to muscles

Lesson V: Bugs and Insects

attaching to ligaments and tendons, which attach themselves to bones in a human body.) Movement is accomplished through these moving muscles, which in turn, move the plated exoskeleton parts. Exoskeletons are primarily made of a substance known as 'chitin' which is comparable to our real-world plastic. This substance is made to be self-moistening to prevent the surface of the insect from drying out. Insects have other unique physical features. The legs are all attached to the thorax, and all organs are located in their abdomen. The "brain" is actually found throughout the body in the form of nerve bundles that run from the head down through to the abdomen.

Ecology Insects play many roles in the garden. Insects can be predators, pollinators, and pests (defined by humans because these insects eat our food crops). Common predators include: ladybugs, praying mantis, assassin bugs and green lacewings. Common pollinators include bees, flies, butterflies and ants. Common pests include aphids, Colorado potato beetles, and cabbage worms. In this lesson we play the game "Ladybug/aphid tag" to introduce students to the roles insects can play in the garden and the importance of a balanced mix of critters.

Lesson V Procedure

Activity	Summary	Time Needed
Opening	Attendance, check-in about previous week, rules reminder, agenda for the class.	5-10 minutes
Insect Anatomy/Ecology K-2 nd : 3 rd -5 th :	Show students insect anatomy poster, and discuss the parts of an insect. Sing the insect song (see attached instructions). Ask students to describe insects they have seen at school or in their gardens at home - What did they look or sound like? What color are they? Where did they find (on a leaf, etc), How did they move (fly, crawl, etc).	10 minutes
Garden Time: Insect Hunt K-5 th	Search for different bugs and insects in the garden. Do they have three body sections? Antennae and wings? What kinds of mouth parts do they have? What do they eat? How do they move? Have students share their discoveries with other students in the class. Check on plants planted in previous weeks and observe growth. Plant more seeds relevant to season.	20 minutes
Ladybug and Aphid Tag K-5 th	Play ladybug and aphid tag and discuss the role of pests and beneficial insects in the garden.	20 minutes
Food and Nutrition	Use toothpicks and different fruits and veggies to create edible insects. Encourage students to make their insects as anatomically correct as possible. It helps to make an example insect. One version that works well is using a raisin for the head, a grape for the thorax, a piece of kiwi for the abdomen, and kale for the wings. Make sure materials are prepped before class begins.	15 minutes
Closing	Clean up. For a review activity, have students share their insects and point out the various parts of the insect anatomy. Fill out feedback form*. Dismiss class. * Or evaluation method of your choice.	5-10 min

Lesson V: Game/Activity Instructions

Ladybug and Aphid Tag

Level: K-5th

Goal: Students will understand the importance of balance in the garden.

Background: Ladybugs are considered 'good' bugs because they eat pests called aphids. Aphids are small insects that suck juices out of common garden plants like roses and brassicas (broccoli, cauliflower, kale etc). In a healthy garden there are a variety of bugs and insects who will create a healthy balance.

Materials: Optional costumes are red, tan and green bandanas (one for each student participating) to distinguish ladybug, aphid and plant players.

How to play:

The game works best if there are at least six students.

Choose a few children to be ladybugs and a few children to be aphids. All the rest of the children are plants. It is helpful to tie a red bandana around the ladybug's heads or arms and green or brown bandannas around the aphid's heads/arms to identify the different players.

Next determine the boundaries for the game so the children know where they can and where they cannot play – make sure they stay out of the streets and away from anything that may be unsafe. Also explain the safety rules – how to tag without hurting or pushing each other.

In the game, the ladybugs tag the aphids and the aphids tag the plants.

Once tagged, the player must freeze and not participate in running around.

You can play this game several times and select more or less ladybugs versus aphids versus plants. After each game, reflect with the children about what it might be like if there were no ladybugs in the game (all the plants would freeze) or if there were no aphids (there would be nothing for the ladybugs to eat).

Insect Song:

****To the tune of 'Old MacDonald Had a Farm:'**

I am in insect in this life and this is what I look like: (*There was a farmer who had a dog and BINGO was his name-o...*)

Two antennae (make antennae with your hands/fingers in your head) (*B-I-N-G-O...*)
Compound eyes (make large round eyes with your hands above your eyes) (*B-I-N-G-O...*)
1-2-3-4-5-6 legs (count 1-2-3 on one side of your body, 4-5-6 on the other) (*B-I-N-G-O...*)
Two pair of wings so I can fly (make flapping motion with your arms) (*AND BINGO...*)
A thorax (touch your chest) (*WAS HIS...*)
And an abdomen (shake your hips and abdomen) (*NAME-O*)

Recipe: Edible Insects

Supplies needed: fruits and veggies, toothpicks, plates for each student

Use toothpicks and different fruits and veggies to create edible insects. Encourage students to make their insects as anatomically correct as possible. It helps to make an example insect. One version that works well is using a raisin for the head, a grape for the thorax, a piece of kiwi for the abdomen, and kale for the wings. Make sure materials are prepped before class begins.

Lesson VI: Soil and Compost

Title: Soil and Compost

Time Needed: 60-120 Minutes

Age/Grade: K-5th

Lesson Objectives:

Students will be able to:

- Describe the role that soil plays in a healthy ecosystem.
- Explain how compost is produced and how it benefits plants.
- Identify producers, consumers and decomposers and their roles in the soil food web.

Vocabulary: Sand, silt, clay, soil, particle, producer, consumer, decomposer, plants, animals, bacteria, fungi, food web.

Materials:

- Soil Food Web Poster
- Decomposer Tag Costumes
- Mason Jars for Soil Tests
- Compost Materials

Discussion Questions:

Why is soil important?

What materials are found in soil?

What animals live in soil?

Can you describe the soil food web?

What is a producer, consumer, and decomposer?

What role does soil play in producing food?

Lesson Background

Soil is the foundation of the food and other materials that help sustain us. The food we eat, the clothes we wear, and the homes we live in, could not have been produced without the help of soil. Soil is formed from weathered rock, minerals, and different living and dead **plants, animals, bacteria, and fungi**. Soil is found on the top layer of the earth and develops over millions of years as bedrock is broken down by wind, water, and microorganisms. Throughout this lesson, students learn about soil composition, and why soil is essential to plant growth. Students will also learn about all of the creatures living in the

Lesson VI: Soil and Compost

soil and how they are all connected by the **soil food web**.

Soil is important for sustaining life for numerous reasons, including: Producing and absorbing gases, serving as a medium for plant growth, filtering water and waste, and providing a home to organisms (plants, fungi, bacteria).

Soil is made up of different sized **particles**. Particles are the smaller pieces that make up soil. **Clay** is made of tiny particles that make it difficult for water to flow through the soil. In contrast, **sand** is made up of larger particles, and allows water to drain easily. **Silt** has particles that are larger than clay, but smaller than silt. These three materials make up soil texture, and impact the soils' ability to retain water, which impacts how well certain types of plants can grow in the soil.

The soil food web and the web of life, are important concepts for students to understand. The web of life is the connection between different life forms (plants, animals, microorganisms and decomposers, fungi, etc). The food web describes the transfer of energy between life forms in the ecosystem. A **producer** produces energy from the sun using photosynthesis (plants, algae, etc). A **consumer** consumes plants, or other consumers, to get energy (herbivores, carnivores, and omnivores). A **decomposer** consumes dead, organic material to produce energy, is vital to soil production and reduces organic waste in the ecosystem (such as worms).

Lesson VI Procedure

Activity	Summary	Time Needed
Opening	Attendance, check-in about previous week, rules reminder, agenda for the class.	5-10 minutes
Garden Time K-5 th	<p>Soil Samples: Have students take soil samples from several different parts of the garden (in jars). Add water and shake. Tell students they will examine the jars next week to see the different parts of the soil (clay, silt, sand). (See attached instructions).</p> <p>Compost Exploration: If your garden has a compost pile, work with students to turn the compost pile, add green and brown materials, and explore what is living in the pile.</p> <p>Check on plants planted in previous weeks and observe growth. Plant more seeds relevant to season if garden space allows.</p>	30-45 minutes
Compost Chaos	Play Compost Chaos (see attached instructions)	15-40 minutes
Soil Food Web Activity	Lead students in a discussion about the soil food web and the roles of producers, consumers, and decomposers (see background information above). Have students make a food web collage using pictures from magazines or their own drawings. Make sure to have examples of producers, consumers, and decomposers available for students. Have the students draw lines showing how the different plants and animals are connected (i.e. connect cows to grass, because cows consume grass).	20 minutes
Food and Nutrition	Prepare snack for students (i.e. snack of roasted root vegetables that grow directly in the soil). Have students wash hands and serve snack.	15 minutes
Closing	Clean up. Have students split into pairs, and share what a decomposer is, and why decomposers are important for soil and plant health. Fill out feedback form*. Dismiss class. * Or evaluation method of your choice.	5-10 minutes

Lesson VI: Game/Activity Instructions

Soil Composition

Description: Learn about soil composition and texture through a hands on exploration activity.

Grades: K-5th

Materials:

- Trowels
- 3 Glass Jars
- Water
- Soap (if available)

Procedure:

1. Work with students to fill up each jar with soil from three different areas in the school garden. This works best if you dig about 6-12 inches into the soil before gathering the soil. If you have time, sift the soil (removing vegetable matter, rocks, and sometimes worms) before filling the jars. Fill about 2/3 full.
2. Label jars with the location in the garden.
3. Add water to each of the jars (close to the top). Put on the lids.
4. Have students shake the jars.
5. Tell students that the soil will settle into three different layers (sand, silt, and clay). Depending on the area in the garden, the different jars could look different.
6. Let rest for at least week.
7. Observe the soil layers in upcoming weeks. Discuss with students how clay, sand, and silt allow water to flow differently through the soil, impacting different plants' ability to grow.

Adapted from Fine Gardening Online. (See References)

Compost Chaos

Author: Bob Hatton

Illustrations: Jon Wagner

Grade level: 3rd-5th

Overview: This garden-based education game is a fun way to familiarize students with some basic composting concepts.

Purpose: Composting is an important facet of organic gardening and a tremendous waste-reduction practice. Teaching students about composting helps them become more aware of where their food waste goes and what they can do about it. It is also a useful skill to teach students if they ever want to practice gardening at home or in the future.

Objectives: After playing this game, students should come away with the following:

- 1) Compost piles should be alternately layered with “green” and “brown” materials.
- 2) Compost piles should be turned and watered to speed up the decomposition process
- 3) Worm bins are an option for composting food scraps.
- 4) Using a tumbler is a method for composting
- 5) Creating your own compost can be a fun and exciting endeavor

Materials:

Enough room for everyone to stand in a circle.

Procedure:

- Begin with an open-ended question that asks about different ways that we build soil or different ways that we compost.
- As students supply answers, pull out a little more detail. For example, a student might say, “We make compost in the bins outside.” Educator: “Yes. That’s right. What kinds of things do we put in the bins?” After the students have supplied some answers, the educator might say, “Yeah. Great. So straw, leaves, and twigs are all carbon-rich materials and generally brown colored so we call them the ‘browns.’ The vegetable trimmings and such are often leafy and green so we call them the ‘greens.’ Ideally, we add browns and greens to the compost in layers. What else do we need to do to the compost? Does it just sit there?” etc.
- Ideally, the students already have seen some or all of this in action so it need not be so talky. The main points can be communicated during the explanation of the gesture combinations in the game.
- To play the game, have the students form a circle. While explaining the rules, it is probably best for the educator to be part of the circle but be sure to explain that someone will be standing in the middle of the circle. The person standing in the middle of the circle is the Composter.
- The Composter stands in the center of the circle, spins around, points at one of the participants, and calls out one of the catch phrases.
- When the Composter directs his/her finger towards someone in the circle and calls out a catch phrase, there are corresponding actions that the pointed-at participant and the participants to the immediate right and left of that person must take.
- The participant who is slowest to react (if that is clear) takes the Composter’s place in the middle and the game continues. If all of the participants are reacting quickly and/or simultaneously, then the Composter stays in the middle and finds someone else to point at. This game can continue indefinitely. The possible catch phrases that the Composter

can utter: Worm Bin, Tumbler, Layer Brown, Layer Green, Compost -Water, Compost - Turn, and Compost –Done!

The corresponding gesture combinations do not all need to be used and, if they are, they should be introduced incrementally instead of all at once. Please see the next page for illustrations of the gesture combinations:

- Worm Bin: Pointed-at wiggles side to side like a worm, sides turn in and stretch out their arms with thumbs up – touching right fingertips to the other’s left fingertips and vice versa.
- Tumbler: Pointed-at wiggles front to back – rounding and arching their back, sides mime the action of turning the handle on a compost tumbler.
- Layer Brown: Pointed-at squats, sides turn towards each other and try to beat the other person to say the word “Green” (opposite for Layer Green.)
- Compost – Water: Pointed-at grabs nose with thumb and index finger of one hand and mimes submerging into water, sides hold their hands over the pointed-at’s head and mime the action of flicking water off of their finger tips
- Compost – Turn: Pointed-at spins around in a circle, sides mime the action of turning a compost pile with a pitchfork.
- Compost - Done: Pointed at squats, makes a fist with one hand and thrusts that same elbow in towards their stomach; sides turn towards each other and do a high five, all three exclaim, “Yes!” (or perhaps “Black Gold, Baby!”)

Variation:

These Compost Chaos combinations could also be part of a larger game called “Soil Builders” that would also include the following.

- Green Manure: Pointed-at drops head, sides mime slashing action.
- Sheet-mulch: Pointed-at sticks one of their hands out and a little bit down, sides turn in and stick their hands in the same place. The three hands will form a stack. The slowest of the three switches with the pointer.
- Cover Crop: Pointed-at ducks and covers head, sides turn in and stick their arms up and out to form an arch.

Debriefing the Game:

When the students are starting to show signs of tiring of this game or it is time for the next rotation, try to do a quick debriefing before moving on. You can ask some of the same questions as you asked before the game started and you should get some quicker and more solid responses. “Did you have fun?” or “Did you like that game?” are fair questions to ask as well. Reinforcing composting concepts is the educational objective but more importantly, this game should be fun. Hopefully, the students are associating these composting concepts with good times in the garden – having fun wiggling like a worm and sharing a few laughs as they watch their classmates spin around in circles, etc.

COMPOST CHAOS

JW 5-5-11

Worm bin



Layer Brown/Green



Tumbler



Compost Turn



Water



Yes! **DONE** Yes!



Lesson VII: Wondrous Worms

Title: Wondrous Worms

Time Needed: 60-120 minutes

Age/Grade: K-5th

Lesson Objectives:

Students will be able to:

- Describe basics of how worm bin composting works.
- Explain why worms are important for soil & plant health.
- List the main anatomical parts of a worm.

Vocabulary: Decomposer, casting, gizzard, red wiggler, hermaphrodite, clitellum, worm bin, and bedding.

Materials:

- Worm Bin
- Worm placemats (1 per student)
- Popsicle sticks (1 per student)
- Worm anatomy poster
- Book: Worms Eat Our Garbage or Diary of a Worm
- Optional activities: Supplies to make a school worm bin (See Worm Bin Instructions) or mini- Worm Bin

Discussion Questions:

Worm Ecology: Where do earthworms live? Why do we call them earthworms? How do worms move? (wiggle through soil, moving it all around)

Worm Anatomy: What does a worm eat? Can a worm bite you? If a worm has no teeth how does it crush up its food? How do you know a worm is all grown up? (Clitellum for reproduction)

Worm Bin: What does a worm need to live? (If this is confusing ask kids about another animal that they know such as a tiger or other charismatic creature). Why would we want to keep worms in a bin?

Lesson Background

Ecology: Worms are **decomposers**. They digest dead and decaying organic matter that is then excreted as **castings**. The castings are excellent fertilizers high in nitrogen, phosphorus and potassium. Thus by digesting organic material and excreting it they help to make healthy soil. They also help soil health by loosening the soil as they create pathways while seeking out food. These pathways allow air and water into the soil. This makes them true **tillers**,

Lesson VII: Wondrous Worms

organisms that turn and loosen the soil.

Biology: Segmented worms, such as earthworms, have a very interesting anatomy. Segmented worms have no teeth, and instead mash up their food in a **gizzard** that contains some sand and grit from the organic matter they eat. While a worm has no teeth it does have plenty of hearts. Segmented worms have **five hearts** that beat as one and can be seen towards the anterior (mouth end) of the worm. Segmented worms are also **hermaphrodites** meaning they have both male and female reproductive organs and can reproduce asexually. A worm is of reproductive age once it has a **clitellum**, which is a band around the front end of the worm. Worm cocoons, which are small, lemon shaped and hold 3-5 baby worms, are secreted from the clitellum.

Worm Bins: The most common variety of worms used in worm bins is called '**Red Wigglers.**' The **worm bin** is filled with shredded newspaper called **bedding** that keeps the worms protected from light and provides a moist, soil like environment. As food scraps are added to the worm bin the worms excrete castings we can use in our garden. In good conditions a pound of worms can eat $\frac{1}{2}$ **pound** of food **each day**. Red wigglers are a great variety for bins due to their high tolerance to varying temperatures, and are fast producers (8 worms can produce 1,500 babies in 6 months).

Lesson VII Procedure

Activity	Summary	Time Needed
Opening	Attendance, check-in about previous week, rules reminder, agenda for the class.	5-10 minutes
Introducing Worms!	<p>Show worm anatomy poster and explain the different parts of the worm</p> <p>Worm Observation: Give each student a worm placemat and encourage them to gently examine and observe the worm. Make sure to consider students who are less comfortable touching worms and offer popsicle sticks to use for gently moving the worms around.</p> <p>Worm Bin Exploration and Investigation: Look inside a working worm bin with the students, discuss their observations. If there is not a worm bin available, see attached instructions for making a worm bin with the students.</p> <p>If time allows, make miniature worm bins using old yogurt containers and worms from an existing bin. Send kids home with a few worms and some scraps.</p>	15-25 minutes
Garden Time	<p>Explore the garden for evidence of decomposers (earthworms, red wigglers, as well as mushrooms). Ask students to compare and contrast the decomposers they find in the garden with those in the worm bin.</p> <p>Plant seeds with students, and add worm castings and discuss how castings help provide nutrients for the plants</p>	15-20 minutes
Decomposer Tag	Play Decomposer Tag (see attached instructions).	10-15 minutes
Soil Poems 3 rd -5 th	Work with students to create soil and worm poems (see attached instructions).	10-15 minutes
Food and Nutrition	Provide tasting to students. If possible, add fruit or vegetable scraps into the worm bin	10-15 minutes

Lesson VII Procedure

Activity	Summary	Time Needed
Closing	Clean up. In pairs, have students describe how a worm bin works and why worms are useful in the garden. Fill out feedback form*. Dismiss class. * Or evaluation method of your choice.	5-10 minutes



Lesson VII: Game/Activity Instructions

Decomposer Tag

Description:

Students play a freeze tag game where frost tries to tag and freeze the plants. The earthworms unfreeze the nutrients trapped in dead plants, allowing them to return to the cycle of life.

Grade: K-5th

Time: 5-20 minutes

Materials: 2-5 light colored and 1-2 dark colored bandanas (optional).

Procedure:

1. One student is *FROST* (dark colored bandana).
2. 2-5 Students are *EARTHWORMS* (light colored bandanas). All other students are *PLANTS*
3. *FROST* kills plants by tagging them. If plants are tagged, they are frozen until one of the decomposers unfreezes them. The decomposers unfreeze the plants as fast as or faster than death freezes them.
4. The game does not end. Give students the opportunity to play the different roles (using short games). At the end, ask students about how this relates to the web of life and decomposers.

Safety:

Make sure to designate safe boundary lines for the playfield, and model the difference between a gentle tag and a touch that could hurt.

Variation:

To demonstrate that life would stop without decomposers recycling dead things, you can allow *FROST* to tag and freeze the *EARTHWORMS* along with the *PLANTS*. The game and life on earth *END* when everyone is frozen except *FROST*.

Soil Poems

Description: Make observations and use describing words about different types of soil. Create group soil poems.

Grade: 3rd-5th

Time: 10-20 minutes

Materials:



- 3 clear containers (ideally jars) containing compost, garden soil (including rocks/clay), and worm castings.
- Squares of paper (15 for each container).
- Pencils
- Containers for paper strips.

Procedure:

1. Lead students in a discussion about words we can use to describe different soil types, such as brown, earthy, moist, sticky, crumbly, soft, etc.
2. Divide students into three groups and give each group a container filled with one type of soil, and have the students make observations about their soil. Tell them to pick a word they would use to describe the soil and write it on one strip of paper, fold it, and put it into a container.
3. When each student has done one word for their group's soil type, have the groups rotate the next station. Ask each student to write a new word that describes the next type of soil. Remind them to think about the differences they notice between the soil types.
4. After completing all three rotations, ask four or five different students to draw slips representing each soil type.
5. Write the words in order, to create a soil poem for each container of soil.

Adapted from: "Sensual Soil" The Growing Classroom: Garden-Based Science. (See References)

Creating A Worm Bin

Materials:

- 1 plastic storage tub (10-18 gal)
- Newspaper
- Redworms (aka Red Wiggler Worms)
- Drill
- Water
- Food scraps



Process:

- Drill holes all around sides of bin and in lid (for air flow).
- Make drainage hole at bottom. Cork the hole, or tilt bin so liquid flows away from hole
- Shred newspaper, and wet so it's like a wrung-out sponge.
- Fill bin $\frac{3}{4}$ with moistened shredded newspaper
- Put some soil or castings over newspaper (need some kind of grit if don't have castings)
- Add worms
- Cover with another layer of moist newspaper.

Feeding:

- Worms will eat about ½ their weight each day.
- Add fruit and veggie scraps, tea bags & coffee grinds, eggshells.
- No meat, dairy or oils.
- Chop up large pieces – the worms can break it down faster with more surface area.
- Bury food completely under bedding.
- Rotate the spot where you place the food.
- If food starts rotting in the bin, reduce the amount you are adding.
- As the worms multiply, you will be able to add more food.

Bin Habitat:

- Add more bedding when needed (maintain a cover of at least 2 inches of bedding)
- Keep bedding moist at all times
- Occasionally drain out excess liquid
- Keep temperature between 55 and 80 degrees at all times.

Harvesting the Castings

The compost is ready to harvest when it looks like soil, usually every 2-6 months (frequency will depend on bin size, amount of worms, and how much food is going in).

Two methods:

Migration method:

- Move all bedding to one side of the bin
- Only add food to the side with the bedding
- Over 1-2 months, the worms will all migrate to that side of the bin, leaving the other side worm-free castings.
- Harvest the castings from the worm-free side.
- Then move the bedding to the other side, start adding food to that side.
- Harvest the other side 1-2 months later.



Dump, divide, and sort:

- Make little mounds of compost
- The worms will move down to avoid the light
- After a few minute, remove compost off the top
- Repeat until you have removed all the compost, and little piles of worms remain.

USING THE COMPOST:

Add a small handful to the base of the plant, lightly dig it into the surrounding soil, and then water it. This will give your plants a good nutrient boost.

Lesson VIII: Celebration!

Title: Celebration!

Time Needed: 60-120 minutes

Age/Grade: K-5th

Materials:

- Tools for harvesting
- Seeds appropriate for season
- Garden jeopardy materials (see attached instructions)
- Game materials for several different garden games (ladybug aphid tag, decomposer tag, etc)

Lesson Background

The last lesson of the term is a great opportunity to review what was learned and celebrate the experiences and accomplishments of a term of Garden Club. Encourage a festive atmosphere by providing a special tasting, and spend time reflecting on what was learned and tasted in Garden Club that term. Giving students an opportunity to choose a favorite game to play again is a fun way to reinforce a specific garden topic, and garden jeopardy is a great way to do a comprehensive review of the lessons while still having fun.

Lesson VIII Procedure

Activity	Summary	Time Needed
Opening	Attendance, check-in about previous week, rules reminder, agenda for the class.	5-10 minutes
What did you eat yesterday?	Ask students what they ate yesterday. Talk about ways to add more fruits and vegetables into each meal. For example, if they ate a hamburger, add a slice of tomato...	10 minutes
Garden Jeopardy	Play Garden Jeopardy (see attached instructions).	25-35 minutes
Garden Time	Harvest vegetables planted by students earlier in the term, and check on plants that are not ready to harvest. Plant seeds for the following term if appropriate to the season.	15 minutes
Free Choice Game	Review the games played over the term of Garden Club (decomposer tag, ladybug aphid tag, pollinator tag, etc) and have students vote and choose one game to play again.	15 minutes
Post Evaluation	Pass our post-evaluations (see overview section). Help younger students complete the evaluations by reading them out loud and walking the class through the process together.	15 minutes
Food and Nutrition	Harvest or prepare a special tasting and talk with students about the importance of eating fruits and veggies every day. Review the vegetables that have been tasted that term in Garden Club and ask which were students' favorites. Two great options for a special tasting include Kiwi Parfaits and Rainbow Smoothies (recipes attached).	15 minutes
Closing	Clean up, fill out feedback form*. Dismiss class. * Or evaluation method of your choice.	5-10 minutes



Lesson VIII: Game/Activity Instructions

Garden Jeopardy!

Description: Review and reflect on garden lesson topics.

Grade: 3rd-5th

Time: 25-35 minutes

Materials:

- White board or flip chart
- Paper

Procedure:

1. Make a chart on a white board or flip chart, with five columns and six rows. In each of the boxes on the first row, write a category name, i.e. “bugs and insects,” “soil and compost,” “worms,” etc.
2. Move down to the second row. Write 100 in each box in the second row, 200 in the boxes in the third row, 300 in the fourth row, and 400 in the fifth row, and 500 in the 6th row.
3. Make a master sheet with each topic at the top, and 5 questions and answers related to each topic, increasing in difficulty from easiest to hardest. Mark each question 100, 200, 300, 400, or 500, with 100 being the easiest, and 500 being the hardest.
4. Divide students into even teams. Have each team take turns choosing a category and a number, and ask them the corresponding question. You can ask all the teams, or just that specific team. Erase the number from the board when you ask the question.
5. Keep score if you want, by tallying the numbers from each question answered correctly. You can also subtract the number of points if they answer incorrectly.
6. Optional: Tell the children their total scores. Have each team choose an amount of points, equal or lesser value to their score, to wager for the final Jeopardy round. Have each team right down the amount of a piece of paper and turn into you. Ask an extra hard “Final Jeopardy” question. Each team writes down their answer and turns it into you. Subtract or add their wager to their score after receiving their answers. The team with the most points wins.

Recipe: Kiwi Parfaits

4 medium-sized kiwis
1 Tb sugar or honey (if using plain yogurt)
juice of half a lemon or 1 ½ tbsp. lemon juice (optional)
Plain or vanilla yogurt
Graham crackers (optional)

Put graham crackers in plastic bag or between wax paper and press into crumbs. Cut each kiwi in half and scoop out the flesh. Put in bowl with sugar or honey and the lemon juice; use a fork to mash the kiwis into sauce. It's okay if it's lumpy!

Sprinkle a layer of graham crackers in the bottom of a glass or bowl. Layer with a scoop of vanilla yogurt, and then the kiwi sauce. Repeat with 1-2 more layers ending with the kiwi sauce on top. Eat immediately, or the yogurt will begin to separate.

Recipe: Rainbow Smoothies

Plain or vanilla yogurt
Strawberries, raspberries, blueberries, or other fruit, frozen if possible
Bananas
Spinach
Orange juice or milk (optional)

Blend all ingredients in a blender. If you don't have frozen fruit, add a handful of ice before blending. Thin with orange juice or milk if it seems too thick.

Bibliography And Appendices

Appendix I: Garden and Food Related Children's Books

Appendix II: Garden Based Curriculum Resources

Appendix III: Gardening Resources

Bibliography

1. Ames, L. 1994. Draw Fifty Flowers, Trees, and Other Plants. New York, New York: Broadway Books.
2. Appelhof, M., M. Fenton, and B. Harris. 1993. Worms Eat Our Garbage. Kalamazoo, MI: Flower Press.
3. Ashworth, S., and K. Whealy. 2002. Seed to Seed: Seed Saving and Growing Techniques for Vegetable Gardeners. White River Jct. VT: Chelsea Green Publishing.
4. Barrett, K., J. White, and C. Manoux. 2008. Botany on Your Plate: Investigating the Plants We Eat. Burlington, VT: National Gardening Association.
5. Batholomew, M. 2006. All New Square Foot Gardening: Grow More in Less Space. Brentwood, TN: Cool Springs Press.
6. California School Garden Network Garden-based learning working group, (2009). Research "Briefs". Retrieved from (<http://www.csgn.org/research.php>)
7. City Farmer Urban Agriculture Notes. Composting with Red Wiggler Worms. <http://www.cityfarmer.org/wormcomp61.html> (Accessed November 16, 2010)
8. Cornell University Gardening Resources. Low Cost Grow Light Frame Plans <http://www.gardening.cornell.edu/factsheets/growlite/index.html> (Accessed November 16, 2010)
9. Fine Gardening. How is Your Soil Texture? (Accessed November 16, 2010)
10. Gardeners Supply Company. Gardening Under Lights: How to Grow Seeds and Plants Under Artificial Light. <http://www.gardeners.com/Gardening-Under-Lights/5080,default,pg.html> (Accessed November 16, 2010)
11. Growing Gardens Home Gardening Manual. 2006
12. Jaffe, R., and G. Appel. 1985. The Growing Classroom: Garden Based Science. Addison-Wesley.

13. Junior Master Gardener Handbook. 1999. Junior Master Gardener Teacher/Leader Guide Level 1. College Station, TX: Texas Agricultural Extension Service.
14. Kids Health. Go, Slow, and Whoa! A Kid's Guide to Eating Right. http://kidshealth.org/kid/stay_healthy/food/go_slow_whoa.html (Accessed November 16, 2010)
15. Metro Regional Government. Composting with a Worm Bin. <http://www.oregonmetro.gov/index.cfm/go/by.web/id=554> (Accessed November 16, 2010)
16. NASA. We Study Soil Because It's A(n)...<http://soil.gsfc.nasa.gov/pvg/1-1why.htm> (Accessed November 16, 2010)
17. National Institute of Health and the National Heart, Lung, and Blood Institute. We Can! Ways to Enhance Children's Activity and Nutrition <http://www.nhlbi.nih.gov/health/public/heart/obesity/wecan/eat-right/choosing-foods.html> (Accessed November 16, 2010)
18. Nelsen, J. 2001 Positive discipline: A teacher's A-Z guide: Hundreds of solutions for almost every classroom behavior problem. Roseville, CA: Prima Publishers.
19. Oregon State Extension Service. Planting Guidelines. <http://extension.oregonstate.edu/catalog/html/grow/grow/planting.html> (Accessed November 16, 2010)
20. Oregon State Extension Service Gardening Encyclopedia. Monthly Planting Calendars. <http://extension.oregonstate.edu/gardening/calendar/> (accessed November 16, 2010)
21. Patten, E. and K. Lyons. 2003 Healthy Foods from Healthy Soils: A Hands-on Resource for Educators. Gardiner, ME: Tilbury House Publishers.
22. Solomon, S. 2007. Growing Vegetables West of the Cascades: A Complete Guide to Organic Gardening. Seattle, WA: Sasquatch Books.
23. Washington State University King County Extension. Fiber: It keeps things Moving. <http://king.wsu.edu/nutrition/documents/6.FiberUnit2Grades4-5.pdf> (Accessed November 16, 2010)

24. Washington State University King County Extension. Food Sense CHANGE Curriculum: Cultivating Health and Nutrition through Gardening Education. <http://king.wsu.edu/nutrition/change.html> (Accessed November 16, 2010)
25. Veggie Preference Survey. FoodCorps. <https://foodcorps.box.com/s/jddubf1bo5t8j6fcdy1j> (Accessed January 13, 2016)

APPENDIX I: GARDEN & FOOD RELATED CHILDREN'S BOOKS

Fiction

All Our Fruits and Vegetables – Roberta L. Duyff

Join a group of students who are learning about gardening just like kids in Youth Grow. Plant seeds indoors, transplant seedlings in the garden outside, identify different vegetables and, last but not least, sample these new foods.

A Diary of a Spider – Doreen Cronin

This book is a great way to teach kids about spider's role in the world and learn to empathize with our small non-human counterparts. Through a series of journal entries by a young spider, this book brings you into a spider's perspective of the world where you find out what spiders learn in school, what they eat and who they fear.

A Diary of a Worm – Doreen Cronin

Take a look into a worm's daily life and discover the difficulty and fun that a young worm experiences in school and at home. This book makes humorous comparisons between similarities and differences between worms and a people.

Compost! Growing Gardens from Your Garbage – Linda Glaser

This colorfully illustrated story shows how one family uses food scraps and plants from their garden to make compost. It demonstrates the basic steps you need to take in order to care of your compost, and how it is then incorporated back into the soil where new seeds are planted. This story is a great way of showing students about ongoing cycles in our gardens and provides basic composting instructions in the back.

Growing Vegetable Soup – Lois Ehlert

Simple colorful images and of this book will walk kids through the basics steps of growing a garden. After planting seeds, watering, weeding, waiting and harvesting, they finally end up with a delicious bowl of vegetable soup!

How Groundhog's Garden Grew – Lynne Cherry

Follow the illustrated Groundhog through the seasons of eating and growing vegetables.

My First Garden – Tomek Bagacki

Get kids excited about growing gardens with this sweet story. A young boy falls in love with riding his bike out of town and while doing so, comes across a beautiful garden of flowers. He is so excited by this discovery that he decides to embark on the adventure of creating his own garden.

Stone Soup – Ann McGovern

This classic tale of trickery tells the story of a young hungry traveler who enters the home of strangers and manages to feed himself with the promise of making soup from a stone. This story shows how you can make a delicious meal all from ingredients found in a simple garden.

The Lorax – Dr. Seuss

This is a classic story of the enthusiastic Once-ler who opens a business cutting down fluffy Truffula Trees to make silky fabrics. His business grows bigger and bigger and although Lorax (who speaks for the trees) warns him not to cut down the trees and pollute the air, the Onc-ler is hooked on success and continues expanding his operation. This poetic tale creatively shows the importance of respecting our earth. 57pages.

Tops and Bottoms – Janet Stevens

This book teaches kids about which plant parts we eat through a story of a lazy bear and a tricky family of rabbits who grow food on his land. In the end, the bear learns the importance of working hard through the growing season to reap the benefits of his crops.

The Surprise Garden – Zoe Hall

Get kids excited about the great surprises we discover when growing food in our gardens. This is simple but playful story about planting seeds, discovering sprouts and eating delicious veggies.

Wally's Big Book of Gardening – Susanne Tommes

This is a great resource for beginning gardeners that covers an array of useful information. This book will show you what tools you need as gardener, what plants need in order to grow healthy and strong, how to identify insects and weeds. It also provides a great number of project ideas and suggestions for what you can grow in your garden.

Non Fiction

Bean – Louise Spilsbury

This book of photos offers simple explanations of the basics of beans. The format of the book makes it a great educational tool, posing a new questions on each page ranging from, “What is a bean?” to “when are means ready to eat?”

Blue Potatoes, Orange Tomatoes – Rosalind Creasy

Did you know that some watermelons are yellow? Learn about fruits and vegetables of colors you never knew they could be and teach kids the importance of growing these beautiful and unique varieties. In addition to providing basic instructions on growing and picking these plants, this book also gives basic recipes to help you prepare these colorful vegetables.

From Seed to Plant – Gail Gibbons

Teach kids about the life cycle of plants, seeds and pollination. This book provides great visuals of flower parts, different types of seeds and the various ways that they are dispersed. It also shows the different parts of seeds and how germinations occur.

How are You Peeling? Foods with Moods – Saxton Freymann and Joost Elffers

Get kids to talk about their emotions with this wonderfully creative and hilarious book of fruits and veggies which have been given silly expressive faces. Disappointed onions and angry peppers will get kids to laugh an open up to discussion about feelings.

That's Fresh! Seasonal Recipes for Young Cooks – Braiden Rex – Johnson and David C. Wasson

This book is divided into four sections (spring, summer, fall and winter) making it easy to find a delicious recipe which allows you to use ingredients from your garden or local farmer's market. Directions at the front of the book explain terms and cooking techniques useful for beginners.

APPENDIX II: GARDEN BASED CURRICULUM RESOURCES

Botany on Your Plate: Investigating Plants We Eat

This curriculum is designed to be an investigative science unit that explores plants through foods we eat. Students explore edible roots, stems, leaves, flowers, fruits and seeds through tasting, observing, dissection, journaling and discussion. Supports standards in math, language arts, nutrition and social studies. Published by National Gardening Association, 88 pages; gr k-4.

French Fries and the Food System by Sara Coblyn

This year-round curriculum provides kids from varied backgrounds a fertile environment in which they can develop an appreciation for the close links between farming and food systems. Lessons range from practical, hands-on activities to social and economic aspects of the food cycle. The lessons and activities are organized by seasons. This book is an excellent resource for classroom and community educators. Geared toward teenagers. 240 pages; gr 5-12.

Food \$ense C.H.A.N.G.E curriculum

Developed by WSU King County Extension, this 'Cultivating Health and Nutrition Through Garden Education (CHANGE)' curriculum offers hands-on gardening, nutrition and cooking activities for elementary aged students. The lessons are aligned to the Washington Essential Academic Learning Requirements (EALR's) and Grade Level Expectations (GLE's). Available at <http://king.wsu.edu/nutrition/CHANGEpdfs.htm>

Garden Detectives

Garden Detectives is a curriculum guide and gardening book that helps students use their powers of observation to solve the mystery of creating a healthy garden. The language is geared for kids 10 and older, but the concepts are applicable to and easily adapted by teachers for younger children. Students explore their garden environment through 20 hands-on activities covering soil fertility, planting strategies, plant selection, composting, watering techniques, and beneficial plants and insects. The guide includes an extensive reference section on nontoxic, kid-friendly treatments for the top 10 garden pests in coastal Southern California. Perfect for home or school gardens. Spiral bound. 125 pages; gr 4-8. Published by artfromscrap.org.

Garden Mosaics by Marianne Krasny

A science education program that combines intergenerational mentoring, community action, and understanding different cultures. Youth learn from elder community members, who share their gardening practices, cultural backgrounds, and wisdom about their community. Available from communitygarden.org/gardenmosaics

Grow Lab

Developed by the National Gardening Association and written and field-tested by educators, this complete curriculum uses fun, illustrated activities to explore plant life cycles, examine plant diversity, and investigate the interdependence of plants, humans, and other living and nonliving things. It's a must for any plant-based studies! Meets National Science Standards; 307 pages; gr K-8.

Healthy Food from Healthy Soils by Elizabeth Patten and Kathy Lyons

Help children understand how their food choices affect not only their own health, but also farmers, the environment, and your local community. This book invites you and your students to discover where food comes from, how our bodies use food, and what happens to food waste. You'll participate in the ecological cycle of food production, compost formation, and recycling back to the soil. Includes background information and a guide for integrating activities into the classroom. 256 pages; gr K-6.

Junior Master Gardeners Manuals and curricula are available from <http://www.jmgkids.us>

The Growing Classroom - Garden and Nutrition Activity Guide

This Life Lab book has step-by-step instructions for setting up a garden-based science program and outdoor classroom activities. Topics include working together in the garden, growing, nutrients, garden ecology, climate, nutrition, gardening tips, and food choices. The new edition includes updated content as well as an expanded gardening tips section. 496 pages. Published by the National Gardening Association.

Worms Eat Our Garbage by Mary Appelhof

This curriculum uses over 150 worm-related classroom or home activities to develop problem-solving and critical-thinking skills in children grades 4-8. Activities integrate science, mathematics, language arts, biology, solid waste issues, ecology, and the environment. Grades 4-8

APPENDIX III: GARDENING RESOURCES

Gardening Books

1. *Seed to Seed: Seed Saving and Growing Techniques for Vegetable Gardeners.* Ashworth, S. and K. Whealy.
2. *Growing Vegetables West of the Cascades: A Complete Guide to Organic Gardening,* Solomon, Steve
3. *Square Foot Gardening: Grow More in Less Space,* Bartholomew, M.
4. *The Maritime Northwest Garden Guide,* Seattle Tilth
5. *How to Grow More Vegetables: And Fruits, Nuts, Berries, Grains, and Other Crops Than You Ever Thought Possible on Less Land Than You Can Imagine* Jeavons, John

School garden/ Food safety Websites:

1. Growing Gardens. <http://www.growing-gardens.org/>
2. National Gardening Association's Kids Gardening. <http://www.kidsgardening.org/>
3. Life Lab. [http://www.lifelab.org/Food safety links](http://www.lifelab.org/Food%20safety%20links)
4. California School Garden Network. <http://www.csgn.org/>
5. Farm to School. www.farmtoschool.org
6. Edible Schoolyard. <http://www.edibleschoolyard.org/>
7. Ecotrust Farm to School. <http://www.ecotrust.org/farmtoschool/>
8. Multnomah County Health Department. <http://www.oregonfoodhandler.us>.

Gardening Websites

1. Oregon State Extension Service. *Planting guidelines, calendars, a gardening encyclopedia, and a link to the Oregon Master Gardeners:* <http://extension.oregonstate.edu/gardening/>
2. Metro's Natural Gardening Guide. <http://www.oregonmetro.gov/index.cfm/go/by.web/id=645>
3. Oregon Tilth. *Classes and organic gardening resources.* <http://www.tilth.org>
4. Organic Gardening. <http://www.organicgardening.com/>

Worm Bins

1. City Farmer Urban Agriculture Notes. Composting with Red Wiggler Worms. <http://www.cityfarmer.org/wormcomp61.html>
2. Metro Regional Government. Composting with a Worm Bin. <http://www.oregonmetro.gov/index.cfm/go/by.web/id=554>
3. Mary Appelhof, author of *Worms Eat My Garbage* <http://www.wormwoman.com/acatalog/index.html>
4. How to Make a Worm Bin <http://whatcom.wsu.edu/ag/compost/Easywormbin.htm>

Grow Lights

1. Cornell University Gardening Resources. *Low Cost Grow Light Frame Plans* <http://www.gardening.cornell.edu/factsheets/growlite/index.html>
2. Gardeners Supply Company. *Gardening Under Lights: How to Grow Seeds and Plants Under Artificial Light.* <http://www.gardeners.com/Gardening-Under-Lights/5080,default.pg.html>

Accessible Raised Beds

1. Instructions for building an Accessible Raised Bed. http://www.ahta.org/documents/AHTA_Raised_Bed_Instructions.pdf
2. *Accessible Gardening* by Joann Woy

Working with English Language Learners

1. Dave's ESL Cafe: <http://www.eslcafe.com/> *The "idea cookbook" under "stuff for teachers" is a great source for language-based games that English learners and English speakers can play.*
2. You Can Teach ESL in the Garden! <http://esl-in-the-garden.lxw.com/> *Includes materials for language learning and gardening, information on successful garden education programs with language learners, and a "do-it-yourself" workshop that you can do alone or with others.*
3. Garden as Learning Metaphor: <http://veslccsf.wetpaint.com/page/ESL+Learners+Build+Community+Garden> *Examples of using plants and plant parts as a way to describe relationships between ideas, language, and systems.*

Evaluations

1. FoodCorps: **Veggie Preference Survey.** <https://foodcorps.box.com/s/j0u9ey67wj81cm1166ce>